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THE LARVÆ

OF THE

BRITISH BUTTERFLIES

AND

MOTHS.

BY

(THE LATE)

WILLIAM BUCKLER.

EDITED BY

GEO. T. PORRITT, F.L.S.

VOL. VIII.

(THE CONCLUDING PORTION OF THE GEOMETRÆ.)

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PREFACE.

THE present volume concludes the Geometræ. A plate has been added containing a number of figures which were not given in their proper places in preceding volumes, but which it has since been thought advisable to reproduce. The same may be said of the description of the larva of *Sterrha sacraria* which appears at the end.

I have again to thank Mr. G. C. Bignell for the list of parasites relating to the species treated of in the volume; and Mr. W. Denison Roebuck for his assistance in copying out the descriptions, etc.

GEO. T. PORRITT.

CROSLAND HALL,
HUDDERSFIELD;
January 13*th*, 1899.

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THE LARVÆ

OF THE

BRITISH MOTHS.

Emmelesia affinitata.

Plate CXXVIII, fig. 1.

For many years a number of friends tried to send me the long-desired larva of *Emmelesia affinitata*, which I have been unable to meet with here, yet their several consignments of seed-eating geometers invariably proved to be its more common congener *E. decolorata*, until Mr. C. G. Barrett turned his attention to this somewhat local species, and it is entirely owing to his very kind efforts, sustained for two or three seasons, that my desire has been accomplished.

Of this species Mr. Barrett first sent me four eggs in 1876, at the beginning of July, but on that occasion, for want of the proper food-plant, the young larvæ were not reared much beyond their second moult, on seeds of *Lychnis vespertina*, a substitute food; but in 1878 Mr. Barrett found and sent me from Pembroke two young larvæ on July 27th, feeding in seed-capsules of *Lychnis diurna*. One, unfortunately injured, died next day, but was replaced by another on the 2nd of August, and supplemented by two more on the 19th, together with needful supplies of the seed-capsules, followed by more.

The first moth was bred on the 14th of July, the last on the 4th of August, 1879, both females, and at an earlier date many chalcids emerged.

The egg in shape is a broad oval, its surface ribbed and pitted. When first laid the colour is pale straw-yellow; on the fifth day it begins to look a little dirty, and it hatches on the sixth.

The young larva is whitish, with black head and a blackish plate on the second segment; after a moult it becomes of a faint drab tint on the body; after the second moult it assumes a deeper tint of drab and has a darker dorsal line, with the belly whitish, the head, the plate in front and plate behind, brownish-black. As it advances in growth it becomes more or less tinged with pinkish on the upper surface, showing decided lines, and of a pearly whiteness below.

The full-grown larva, with reference to the size of the perfect insect, is, like some others of this genus, very small, not more than about from three-eighths to half an inch in length, and from the form and restricted size of its dwelling within the seed-capsule, its natural hunch-backed looping posture tends apparently to dwarf its actual dimension; its figure is dumpy for a geometer, of about equal substance as far as the tenth segment, from whence it tapers a little to the anal extremity; the head is a little less than the second segment, though of a broadish character; the segments of the body are well divided and very plump, yet each having two or three wrinkles across the back; the spiracular region is rather tumid; in colour the head is black or blackish-brown and glossy, the lobes on the crown well defined by the margin of pale skin from the blackish-brown shining plate on the second segment; another plate, less dark, occurs on the anal flap, and there are two remarkable additional horny plates situated one on the outer side of each anal leg; the rest of the body is without gloss, and of a light drab colour broadly tinged with pink down the back and sides, becoming a little paler on the

belly, or a pinkish fawn-colour, or pinkish-brown, as individuals differ, and having a dorsal line and subdorsal lines of deeper pink, but interrupted at each segmental pale fold of skin; a pinkish lateral line runs a little above the spiracles, which are rather large in proportion and blackish-brown; the tubercular dots are inconspicuous, though their positions are indicated each by a minute bristle when seen through a lens.

A variety occurs of a pearly pinkish-grey ground colour, and another variety with rosy-pink melting gradually into reddish-fawn colour on the hinder segments, and having the anterior plate dark only at its hind margin, quite light brown in front, with a fine paler dorsal dividing line.

The pupa is of a dumpy form, five-sixteenths of an inch long; the thorax very plump, and rounded off to the moderately produced head; the wing-covers long and tumid, having their neuration in slight relief; from them the abdomen rapidly tapers in the female to rather a sharp point furnished with two minute bristles; in colour it is brownish-ochreous with darker brown divisions of the flexible segments of the abdomen, the surface glistening. It is generally enclosed in an earthen-covered silken cocoon attached to a small stone or other substance, though sometimes the cocoon is spun within the remains of a seed-capsule eaten out by the larva, where it becomes partly adherent to quantities of frass. (William Buckler, 7th August, 1879; E.M.M., October, 1879, XVI, 102; and Note Book III, 101 and 248.)

Emmelesia alchemillata.

Plate CXXVIII, fig. 2.

The larvæ from which the following description was taken were sent to me at the end of September, 1877, by Mr. J. B. Hodgkinson, of Preston, who had found them feeding on the seeds of the common dead-nettle.

Length nearly half an inch, and tolerably plump in proportion; the head is highly polished, it has the lobes rounded, is a trifle narrower than the second, but wider than the third segment; immediately behind it, on the second segment, is an equally polished half-circular plate, and there is also a similarly polished plate on the anal segment. The body is cylindrical, of tolerably uniform width, tapering a little posteriorly; the segments are plump, the divisions well defined; there are a few scattered short hairs. The ground colour of the dorsal surface is a rather pale but warm purple; the head and the frontal and anal plates are intensely black. A broad pale yellow stripe extends throughout the dorsal area, dividing the black frontal plate into two sections; there is also a similarly coloured but much narrower line along the subdorsal region, and another one between this and the spiracles. The spiracles and tubercles are minute, black; the hairs grey. The ventral surface is uniformly pale yellowish green, with a few minute black tubercles. (George T. Porritt, 3rd April, 1879; Entom., May, 1879, XII, 128.)

Emmelesia albulata.

Plate CXXVIII, fig. 3.

The larva of this species has been described more than once before, and I should not have thought of saying anything about it myself but that when, for the purpose of procuring specimens for figuring, I set to work this season to rear it from the egg, I found that not one of my specimens corresponded with previous descriptions. I am driven to the conclusion, therefore, that this is a variable species, and proceed to record the variety I have met with.

On the 2nd of June of this year (1865) I took some moths, and one female laid several eggs, and

next day I looked for and found some more laid at large on plants of yellow-rattle in the same locality.

These eggs are oval and yellow, paler at first, and becoming richer in tint afterwards, deposited on the flower bracts.

On the 9th of June the little yellowish larvæ with dark heads appeared, and a few days afterwards I captured several others feeding in the green and tender seed-pods of their food-plant. It is easy to detect a larva, as the seed-vessel containing it looks discoloured; but I could not perceive that they spun together any covering for themselves, all I noticed being completely hidden within the seed-pods. After a change or two the larvæ became dirty whitish in tint, the head, plate on second segment, and tip of tail being dark.

About the 30th of June they were full-fed, and were then of a uniform pale primrose-yellow—no lines—but the ordinary dots very small, brownish, with a few bristles, the head brown, the horny plates on the 2nd and 13th segments scarcely tinged with brown; spiracles brown.

Soon after this date they changed to pupæ, but before doing so, as far as I could see, they all left their food and entered the earth; and although I searched diligently, I failed to find any pupæ in the ripened plants where I had previously taken the moths, eggs, and larvæ. (John Hellins, 5th October, 1865; E.M.M., April, 1866, II, 261.)

Emmelesia decolorata.

Plate CXXVIII, fig. 4.

The insect was abundant in a plantation at Grimescar, about a mile out of Huddersfield, in the middle of June last (1867); and I derived considerable satisfaction from watching them deposit their eggs; they flew from one flower-head to another, staying but a

short time on each, and apparently depositing not more than two or three eggs every time they settled.

The egg is bright yellow, and hatches in about eight days.

When very young the larva is yellow, with a shining black head. (George T. Porritt, 24th July, 1867; Entom., August, 1867, III, 316.)

In last month's number of the Entomologist (cited above) Mr. Porritt has given a graphic and most interesting account of the proceedings of the female imago of this species of *Emmelesia*.

As soon as the young larva emerges from the egg it perforates the capsule of the food-plant, *Lychnis dioica*, and feeds on the seeds contained in the interior, of which it henceforth takes possession, and uses it both as a granary and dormitory, never leaving it unless for a similar tenement; within this dwelling it rests in a bent posture, thus accommodating its body to the requirements of the chamber; when extracted it crawls rather rapidly until it finds a vacated capsule or some similar recess, where it can remain concealed from observation; it is full-fed towards the end of July.

The head is narrower than the second segment, porrected in crawling, very glabrous, and not notched on the crown. The body is rather obese, almost uniformly cylindrical, and entirely without humps, but it has a few minute warts, each of which emits a fine but short hair from the summit; the second segment has a double dorsal glabrous plate.

The colour of the head and dorsal plate is wainscot-brown; the body is putty-coloured, with two rather distant, rather narrow purple-brown stripes; below each of these, yet above the spiracles, is a linear series of markings of the same hue; and below the spiracles is a narrow stripe, also of the same purple-brown colour; the ventral area is without markings, as are the claspers; the legs are almost colourless and shining.

I am indebted to Mr. Moncreaff and Mr. Porritt for supplies of this larva. (Edward Newman; Entom., September, 1867, III, 325.)

EMMELESIA TÆNIATA.

On the 14th August, 1877, I received fifteen eggs from Mr. J. B. Hodgkinson, together with the battered remains of the parent moth. The eggs were laid in a glass-topped box, one or two adhering to the box, the others loose.

The egg is elliptical, with a depression on either side, the surface very finely pitted. At first they arrived of a dirty whitish colour; by the 20th they were yellowish, and on the 21st were of a light salmon-colour, becoming of an orange tint by the 24th and turning brown on the 25th, and blackish-brown on the 26th and 27th. One hatched on the 26th, one at 12 p.m. on the 28th, another in the morning of the 29th, and another in the afternoon. All the rest died in their shells.

The larva when first hatched is dingy blackish-green, with the posterior segments rather lighter, and a paler spot halfway down the back; on the third day it is a paler but still dingy green.

Circæa lutetiana and *Hypericum perforatum*, an ash leaf and a nut leaf were tried as food. These five larvæ sustained themselves on, I believe, the *Hypericum* flowers and seed-pods up to the 6th of September, when they were laid up for moulting, but from circumstances I being unable to attend to them, they became damp in the bottle, and on the 8th I found them dead.

They had grown to be fully an eighth of an inch long. The head was darkish brown, and on the second segment a plate of similar brown with paler lines through it, though small, could be discerned. The body was of a warm rather pinkish light brown, with

the three hinder segments paler, and some bristly hairs on the body.

Had they been placed at first on a growing plant, probably they would have thriven. (William Buckler, 8th September, 1877; Note Book III, 208.)

Of this hitherto unknown larva I have at last succeeding in rearing some from eggs. It has baffled me for years to find any special plant to feed it upon. The most likely plant was the enchanter's nightshade. Of this I have beaten acres to no purpose; in fact, it seemed a hopeless task even to discover whether the larva was green or brown, or what it was like. Now, however, I am able to give its history up to date. During the month of July I spent nine days in the Lake district, and paid special attention to getting this species, as usual. The species only comes out of the dark woods when worn. I secured about a dozen females, all of which I kept to lay eggs.

About twenty eggs hatched in the second week of August. I put in the glass, along with them, *Hypericum*, enchanter's nightshade (*Circæa lutetiana*), dead-nettle (*Lamium*), groundsel (*Senecio vulgaris*), knotgrass (*Polygonum aviculare*), and many other plants; and last, not least, a leaf or two of the garden nasturtium. Several of them went to work by making a round hole through a leaf of the last plant,—one appearing to take better to it than the others; the rest seemed inclined to hybernate, while this one was nearly full-fed.

It is quite seven-eighths of an inch long, and the following is a rough description:

Ground colour of the back and sides a rich dark salmon, tinted brown at each segment; on the back there is a pale pink lozenge-shaped spot, darker at the edges, and in the centre of the spot is a clear black wedge-shaped mark; the colour on the back at the anal extremity becomes much paler for three-eighths of an inch, and there are two rows of spots of a brownish-black down to the anal point; the sides and

abdomen are of a pale pinkish-yellow, with no other markings than two spots at each segment underneath of this shape; legs same colour as abdomen; the head slightly darker, with short scattered hairs.

The habit of the larva is much after that of *Emmelesia unifasciata;* when touched it frisks about, as if it wanted to be played with. (J. B. Hodgkinson, 12th September, 1878; Entom., October, 1878, XI, 231.)

The moth appears from the middle of June to the end of July.

The larva hatches about six weeks after the egg is deposited, goes into hybernation when about a quarter of an inch long, and commences to feed again in April on the fruit of any of the mosses, but perhaps more frequently on a species of *Bryum* which grows in wet places.

The following is a brief description of the larva:

Length five-eighths of an inch. The upper portion of the body is fairly hairy or spiny, light brown in colour, with a dorsal row of deeper brown diamond-shaped marks and a series of six black dots; lateral stripe pale yellow; head and under side of the body pale ashy.

The diamond marks remind one of a "pug" larva, and the black dots are very distinct and striking. The entire series of metamorphoses, from the laying of the egg to the emergence of the perfect insect, occupy a period of about ten months. (J. B. Hodgkinson; Entom., May, 1895, XXVIII, 141.)

EMMELESIA UNIFASCIATA.

Plate CXXVIII, fig. 5.

I am indebted to Mr. J. Bryant for the specimens which have enabled Mr. Buckler and myself to work

out the early stages of this species, which had long eluded our investigations.

I have taken the imago at gas lamps here in Exeter, and have several times had eggs sent to me; and amongst other plants I have supplied the young larvæ with what now proves its proper food, namely, *Bartsia odontites;* but, owing to the rapidity with which this plant, when plucked and put in water, decays and becomes mildewed, I had always failed to rear them. In 1862 Mr. Buckler received from Dr. Holland, and figured, a larva now proved to belong to this species; but, as it soon died, the figure remained unnamed, and nothing could be said about it.

In the second week of last September Mr. Bryant sent Mr. Buckler eggs deposited by captured specimens of *E. unifasciata*, and on being instructed by him what to look for, found that *Bartsia odontites* was growing plentifully in the locality in which the moths were taken; when, therefore, the eggs came on to me, I determined not to confuse the larvæ with a number of food-plants to pick and choose from, but put them at once on a potted plant of *Bartsia*. This was about the 14th of September, and unfortunately I was not able to devote much attention to them till the beginning of the present month, when (4th of October), to my dismay, I found the plant dead and withering. However, a careful search enabled me to detect a solitary survivor crawling about on the damp rotten seed-pods, so I felt sure now there was no longer a doubt about the food-plant; and finding that the field which had supplied me with it here had just been ploughed up, I got a supply at once from Mr. Buckler. The seed-pods on the sprigs he sent me were beginning to ripen, so partially opening one of them I placed my little larva on it, and soon saw it hide itself within. I now left it undisturbed for a week, taking it for granted that it was going from pod to pod, and feeding up well; at last I thought I would look for it, and after opening several pods as

carefully as possible, found it stowed away in one of them; but, instead of being increased in bulk, looking shrivelled, and much thinner than when last seen. This was disappointing; but, taking comfort at the thought that more tender diet might suit it better, I asked Mr. Buckler to get some of the greenest pods he could find, and soon discovered that they were just what was wanted. On the 16th of October I found my larva in the act of moulting within a seed-pod, and after this, its last moult, a great change took place in its appearance and manner of life.

About this time, too, Mr. Bryant, having at Mr. Buckler's instigation searched carefully the *Bartsia* plants in his locality, found several larvæ feeding at large; and, as those which he kindly sent to Mr. Buckler exactly corresponded with the one I had reared, there was no difficulty in identifying their species; and from these, together with my own solitary specimen, the following account and descriptions have been drawn up.

The egg is laid in August, and the larva soon hatched.

Perhaps it feeds first inside the flowers of the *Bartsia*, but, at all events, we know that, whilst young, it lives within the unripe seed-pods, which it enters by a hole in the side, remaining hidden until all the seeds are consumed, the frass at the entrance hole alone showing its whereabouts. After its last moult it no longer hides itself, and seems to have no difficulty with the ripening capsules and seeds, still making a hole as before in the side, and inserting its head and front segments as far as it finds it necessary to get at the seeds, all the while holding on with its prolegs to the stem outside. It seems to become full-fed towards the end of October, and goes just under the surface of the ground for pupation.

The simultaneous change of habit and ornamentation at the last moult is very interesting, but I will

leave wiser heads than mine to determine which is the cause of the other.

The eggs were too far gone for description when I had them.

The newly hatched larva is exceedingly small, yellow in colour, with a dark head. Afterwards it becomes paler, of a yellowish-white, and is to look at like a small maggot.

On the 14th of October, just before its last moult, I made this note of its appearance:

Full a quarter of an inch long, and plump, but able to stow itself away in a *Bartsia* seed-pod; tapering towards the head, and not so much towards the tail: the skin smooth and glossy; the usual dots very minute but distinct, being dark; the ground colour yellowish-white; the head dark brown; plate on the second segment pale brown; a sort of pale brownish plate also on the thirteenth segment, which looks darker from the tubercular dots on it being black. On a very close inspection one can trace the course of the lines—soon to be developed distinctly, but they cannot yet be described as plainly noticeable.

Immediately after the last moult its appearance is much prettier than at any other time, the ground colour being of a pale delicate buff, and the lines very clear and almost black; but this contrast is soon lost, the ground becoming darker and dingier, and the lines paler and more diffused.

When the larva has become full-fed the length is about half an inch, the figure stout, somewhat flattened; the fourth, third, and second segments tapering rather rapidly; the head still narrower than the second, and round in shape; half the second segment scale-like and shining; the hinder segments also taper to the tail; the skin is rough and wrinkled; the tubercles are dull white, furnished with short dark brown hairs; the ground colour varies in different individuals, being greyish-yellow, greenish-grey, greyish-brown, or brown; the dorsal line is blackish, beginning very fine

on the front of each segment, thickening towards its end, and slightly interrupted at the fold; the subdorsal line more or less visibly continuous according to the depth of the ground colour, and may be described as a line of stout blackish dashes placed at the folds, sometimes connected by brownish streaks which fade away into the ground colour about the middle of each segment; on segments 10 to 13, the dorsal and subdorsal lines unite to form a darker smoky streak, which tapers away to a point at the anal extremity; below the subdorsal comes a brown wavy line; the spiracular region is brownish above and more yellowish-white below, these colours not being definitely separated by a line; the black spiracles are placed in open spaces of the paler colour; at the tenth segment the lateral lines fade away into the pale colour, thus forming a strong contrast to the united dark lines on the back; below the spiracles comes a clearly defined stripe of dark brown, followed by a broader one not so dark; the belly varied with yellowish and pinkish-white, with two indistinctly darker lines along it; the head and collar yellowish, the dark lines passing through them as freckled stripes. (John Hellins, 25th October, 1869; E.M.M., January, 1870, VI, 187.)

Emmelesia blandiata.

Plate CXXVIII, fig. 6.

The habits of the genus *Emmelesia* seem to make it such a difficult matter to get hold of the larvæ of some of the species that I feel more than ordinary pleasure in being able to say that I have removed *E. blandiata* from my list of desiderata; of course it was not one of the "unknown," for the food-plant, and a description after Freyer, had been given in Stainton's Manual, yet, for all that, I could see no chance of obtaining the larva for years; and now it has not

been by means of British examples that I have worked out its history, although the help came from an old ally.

On the 21st of August, 1880, a sultry day with hot sun and occasional showers, the Rev. John Hellins was strolling in advance of his vehicle through a part of the Brunig Pass, between the Alpnach and Brienz in Switzerland, and was watching the swarms of butterflies on the wing, when he noticed a small grey moth busy over a plant of euphrasy (*Euphrasia officinalis*), which was growing on a bank a little above his head; some misty recollection of the above-mentioned notice in the Manual made him think of *E. blandiata*, and he tried to catch the moth in order to see if it was that species; but failing in this he came back to the plant about which it had been flying, and pulling several shoots of it found that he had secured about a dozen of the eggs that had just been deposited underneath the leaves amongst the open flowers, and these, unfortunately supplemented by some fresh shoots gathered early next morning, and so damp with dew, he posted in a tin box to me on the 22nd, and I received it in the afternoon of the 23rd.

On opening the box I found most of the euphrasy already decayed, for it is one of the plants that fade rapidly from damp, and though I could see several empty egg-shells, there were only four or five tiny larvæ still living, but there was also one bigger and finer than the rest, just emerging from a round hole in a seed-vessel, where it had evidently fed on the unripe contents; a few eggs had remained unhatched, and from these one larva appeared next day, and two more the day following, when I also found another larva of an earlier batch that had already moulted once if not twice.

The young larvæ soon ate their way into the seed capsules, and therein must have moulted, for though their small entrance hole was detected in the upper part of some capsules, they themselves could be seen but

seldom for some time until they had acquired a certain amount of growth, and until the necessity for more food compelled them occasionally to come outside and attack fresh capsules, when they could be better observed; especially was this the case after their last moult, when (like the larva of *E. unifasciata*, Ent. Mo. Mag., Jan. 1870, VI, 187), they assumed a handsome dress admirably designed in harmony of aspect with the food-plant for their protection, whilst living for the remainder of their larval existence more or less exposed; for often they remained with their heads buried in the seed capsules, and the greater portion of their bodies resting outside, and motionless for hours during the daylight; but the succession of brilliant little flowers given forth by the plants seemed quite to divert the eye from the larvæ, and, moreover, their assimilation to the stems and leaves was so perfect, that even when one knew they were present on a shoot, it was with difficulty they could be detected.

The two most advanced in growth moulted the last time in the evening of the 1st of September, the others at intervals later, and the first entered the earth on the 10th, more followed soon, and the last on the 18th.

The only moth bred as yet, a male, appeared on the 14th of August, 1881, and enabled me to make sure of the species, though probably more will emerge in a future season in conformity with the habit of some of its congeners.

Again, during this last August Dr. T. A. Chapman most kindly sent me from Switzerland, amongst other things, a good supply of euphrasy shoots (gathered near Engelberg, some twelve or fifteen miles as the crow flies from the spot where Mr. Hellins had seen his moth the year before) on which he had detected eggs, and from these Mr. Hellins has succeeded in rearing to full growth about a dozen larvæ evidently of the same species, and has thus enabled me to supplement my description drawn from the examples I

had reared myself; these were about a week later in their changes than the larvæ of 1880.

The egg of *Emmelesia blandiata* is oblong and somewhat flattened, one end more rounded than the other; rather more than one-sixtieth ($\frac{1}{60}$) of an inch long and about one-hundredth ($\frac{1}{100}$) of an inch wide; the shell reticulated rather coarsely and shallowly, not very shining, and of a deep yellow colour; when empty the shell looks white.

The newly hatched larva is rich yellow, with blackish-brown head and narrow plate across the middle of the second segment; its skin is glossy, the bristles from the usual spots are somewhat clubbed; in four days' time it is decidedly grown, still yellow,* and with the addition of a dark purplish-brown dorsal line, and a subdorsal line rather paler than the yellow ground and faintly edged with darker. After a moult and increase of size the colouring is more opaque and of a light buff-yellow; afterwards a very faint brownish colour tinges the back, and a slight pearly greyish-whiteness the belly; as they grow they become pale dull green, with a dull purplish dorsal line; but they continue to be very plain little larvæ until the last moult, which is passed when the length of three-eighths of an inch is attained; at full growth the length is half an inch or a trifle more, and the larva is not quite so thick in proportion as its congener *E. unifasciata*, though the segments are plump and well defined, each having two transverse wrinkles near the end; the form tapers gradually forward from the seventh to the head, which is the smallest, and backward a little from the tenth to the end of the thirteenth. The general ground colour is green, varying in richness in different individuals, and is yellower and brighter for the first few days; the head

* The rich yellow colouring of the egg and young larva strikes me as assimilating wonderfully with certain spots, apparently some fungus, with which the euphrasy is much infested; there is also a little yellow grub, apparently dipterous, that shows the same colouring, but we have not reared any to full growth.

is very glossy, greenish-yellow faintly tinged with pinkish, and having two rows of pink freckles down the front of each lobe; the ocelli large and black; the green of the body is well contrasted with the design on the back which occupies the space there between the trapezoidal warts, and is attenuated a little on the posterior and thoracic segments, beginning on the second as merely twin lines, but on all the others consisting of three equally stoutish lines of very dark crimson; of these the dorsal line in the centre is straight, but each outer one in its course along each segment bends inward a little towards the middle in symmetrical progression, enclosing a ground of deep rose-pink within them at either end, but which is lost in the middle of the segment by the complete fusion there of the three dark crimson lines together in a mass, just where the middle of the bends bring them near each other; after an interval of green comes the subdorsal line of very deep pink, and at a less interval a thicker and rather sinuous lateral line, and at a wider interval again below a subspiracular line of the same deep pink colour; the tubercular warts are whitish with minute black central dot bearing a fine short bristle; the anterior pairs of the trapezoidals are quite close to the crimson outer curves of the dorsal design; one wart occurs upon the anterior thickest part of the lateral sinuous line, another behind each spiracle, and others again beneath; the roundish spiracles are blackish with pale centres; the yellow-green of the back is more yellow close to the crimson design, and also on the tumid spiracular region, which on the posterior segment and edge of anal flap is primrose-yellow; against this the outer crimson surface of the anal legs contrasts strongly; beneath on the green belly are three paler lines, the central one the more noticeable; as the larva matures the crimson markings of the back become purplish, and the general ground a deeper green, though the spiracular ridge remains yellowish to the last.

The foregoing describes what I believe to be the typical or complete design of the larva, for it was the one shown by all the larvæ in 1880, and by most in 1881, but amongst the latter there occurred three or four of a variety showing an incomplete form of the dorsal design, which may be regarded as substantiating in a manner the description in the Manual after Freyer.

In this variety the dorsal line as usual is complete throughout, but at the beginning of every segment the two outer or curving lines are absent as far as the first pair of warts, and the pink ground so faintly shown as scarcely to be noted there, but the remaining parts of the design are quite perfect, and so stand out like a dark arrow-mark, or in other words a very elongated triangle at the end of each segment, through which passes the continuous dorsal line.

There were also two or three larvæ with the full pattern, but of much duller colouring, being pale brownish with a pink tinge, and the lines of the pattern also duller.

The larva goes into a light soil for its final change, and forms a compact little cocoon not quite three-eighths of an inch long and about half as wide. The pupa measures five-sixteenths of an inch in length; it is without any peculiarity of form, and of a bright yellowish-green colour for some time, having a broadish stripe of crimson down the middle of the back of the abdomen, suggestive of the larval design, and with rather a glossy surface. (William Buckler, 7th December, 1881; E.M.M., January, 1882, XVIII, 180; and Note Book IV, 39.)

EUPITHECIA CONSIGNATA.

Plate CXXIX, fig. 2.

Towards the end of May, 1868, Mrs. Hutchinson, of Grantsfield, kindly sent me seven eggs of *Eupithecia*

consignata, laid by a female taken in Herefordshire by her daughter. They all hatched in the course of a few days; and I have reared six larvæ, all of which have now spun up.

I have much pleasure in sending a description of this hitherto almost unknown larva.

Larva long, slender, tapering slightly towards the head. Ground colour grass-green, slightly tinged with yellow. Segmental divisions yellowish. Central dorsal line very slender, dark purplish-red, enlarged at the base of each segment into a spear-head-shaped blotch. Dorsal blotches bordered with yellow, and becoming confluent on the capital and caudal segments. Head somewhat broad, green, very slightly marked with purplish-red. Spiracular line puffed, rather paler green than the rest of the body; blotched into purplish-red on a few of the central segments, and more or less bordered with straw-colour. Central ventral line whitish. Body somewhat wrinkled, studded with a very few short, slender, whitish hairs.

Fed on *apple*. Full-fed 14th to 19th June.

Some few years since I bred two of these larvæ from *oak* in Suffolk, and another from *hazel* in Hampshire. I suspected at the time that they were the larvæ of *Eupithecia consignata;* but, as they died in the pupa state, I was unable to verify my suspicions.

This larva closely resembles that of *E. exiguata*. (H. Harpur-Crewe, 22nd June, 1868; Entom., July, 1868, IV, 96; E.M.M., August, 1868, V, 72.)

Through the generous kindness of Mrs. Hutchinson I have also reared a few larvæ of this species. My object in writing these few lines is to draw attention, not to the larva, but to the pupa.

This is quite unlike that of any *Eupithecia* with which I am acquainted. It is more like that of a Tortrix than of a geometer, very long and slender, and twisting the abdominal portion in a very active manner. I think there is little doubt but that the pupa might be found in orchards, under moss, or behind loose

bark. The admirers of the genus *Eupithecia* are greatly indebted to the discoverer of the larva of this very pretty species. (Joseph Greene, July, 1868; E.M.M., August, 1868, V, 73.)

EUPITHECIA PULCHELLATA.

Plate CXXIX, fig. 4.

This interesting and hitherto unknown and undescribed larva has turned up in some numbers during the present summer (1864), and now that its habits and food-plant are known will probably prove to be one of our commonest and most generally dispersed insects. The merit of its discovery is due to my excellent and indefatigable friend the Rev. John Hellins, of Exeter. Last year (1863) both he and I had several batches of fertile eggs of *E. pulchellata*, which were kindly sent us by Mr. J. B. Hodgkinson, of Preston; the young larvæ hatched out well, but though we supplied them with every likely flower we could think of, they refused everything, and perished miserably of starvation.

This summer (1864) Mr. Hellins again received fertile eggs from Mr. Hodgkinson, and, at Mr. Doubleday's suggestion, supplied the newly hatched larvæ with flowers of the common foxglove (*Digitalis purpurea*); finding that they fed freely, grew, and prospered, he at once communicated the interesting fact to his entomological friends, and the result is that the larva has been discovered in some numbers in several different localities; I took about forty in a wood about a mile from my house in less than an hour; some relatives of mine have found it in profusion at Warstow, near Leek, Staffordshire; Mr. Batty has met with it near Sheffield; and Mr. Baker has taken it freely in the neighbourhood of Derby.

It feeds on the stamens and unripe seed-capsules of the common foxglove, spinning the lip of the flower

together, and is, from this circumstance, not difficult to detect.

It is rather a variable larva; I append descriptions of those varieties which have lately come under my notice.

Var. 1. Ground colour dull yellowish-green; central dorsal line broad, continuous, dull dingy purple; subdorsal lines ditto, narrow, interrupted on the anal segments; spiracular line narrow, broken, dingy purple; head brownish, marked with lines of a dingy shade; on the collar is a blackish spot; belly whitish-green, with a whitish central line; the whole body thickly strewed with whitish hairs, and occasionally suffused with dull dingy purple.

Var. 2. Ground colour dull yellowish and whitish-green; central dorsal line dusky green; subdorsal lines ditto; segmental divisions yellowish; spiracular line dull green, very narrow and faint; belly whitish-green, without markings.

Var. 3. Ground colour pale primrose, slightly suffused with green; central dorsal line dull faint green, almost invisible on the posterior segments; subdorsal lines ditto, much broken, having more the appearance of detached spots; spiracular line very faint, pale yellow; belly whitish.

Var. 4. Ground colour bright yellowish-green; central dorsal line broad, pale olive; subdorsal lines ditto, narrow; spaces between central dorsal and subdorsal lines bright yellow; spiracular line faint, broken, dusky green; belly sea-green.

Pupa enclosed in a slight earthen cocoon; thorax and wing-cases yellowish-green; abdomen reddish-yellow; abdominal divisions and tip deep red. (H. Harpur-Crewe, August, 1864; E.M.M., September, 1864, I, 95.)

EUPITHECIA CENTAUREATA.

Plate CXXX, fig. 1.

A geometer larva nearly three-quarters of an inch long, slender and nearly uniform in substance; the head rather smaller than the second segment, which is a trifle less than the third; the head rather bent downwards as in *Lobophora viretata*, and the front legs drawn together when at rest, straight and stick-like. On the anal tip below the flap are two anal *very blunt* points or projections; the segments are deeply wrinkled, marking each into three portions, the middle one being the largest, and other usual two or three wrinkles in the third portion. In colour the head is ochreous, the second segment greenish-ochreous, the rest of the body yellow-green with deep bright yellow folds of skin at the segmental divisions; a dorsal and subdorsal lines of darker green; the spiracles reddish flesh-colour.

The larva came from Mr. C. G. Barrett, of Pembroke, 19th August, 1878. (William Buckler, August, 1878; Note Book III, 252.)

EUPITHECIA SUCCENTURIATA.

Plate CXXX, fig. 2.

On the 28th of September, 1883, came from the Rev. John Hellins as many as thirty larvæ of this good species, all very young and many very little, but they all fed well, not at all on blossoms or seeds, but only on the leaves by eating away the upper green skin, so that the fresh gathered leaves of their food-plant, *Artemisia vulgaris*, appear very soon to be covered with white traces, where in little patches the green has been nibbled away. They ate some amount

of food in this way, and became full-fed after they had moulted two or three times.

On the 2nd of October Mr. Hellins tried mugwort beating again to find me a small pug larva [*Eupithecia innotata*] like I have described in this volume [*i. e.*, Note Book IV] at page 220, but, though not successful in that, he took more *E. succenturiata*, and kindly sent me a dozen of them, amongst them being some almost full-fed, and several full-grown.

The mugwort which yielded the larvæ of *E. succenturiata* grows on sandy soil. (William Buckler, November, 1883; Note Book IV, 192.)

EUPITHECIA PLUMBEOLATA.

Plate CXXX, fig. 5.

During the course of last summer (1865) I had the pleasure of examining a very beautiful and carefully executed collection of drawings of various species of geometers, their larvæ and food-plants. These drawings were the work of a very painstaking Continental entomologist, M. Carl Plötz.

This gentleman figured the larva of *Eupithecia plumbeolata* Haw., feeding upon the flowers of the purple cow-wheat, *Melampyrum arvense* L. This plant is not very common in Great Britain; another species, however, *M. pratense* L., is much more frequent. Finding that this latter plant almost invariably grew in some plenty in those localities where *Eupithecia plumbeolata* was most freely taken, it occurred to myself and several other entomological friends that the larva might very probably be found to feed upon its flowers. I am happy to say that our suspicions have proved correct. Towards the end of June I received a few eggs of *E. plumbeolata* from Mr. J. B. Hodgkinson of Preston, Mr. C. G. Barrett of Haslemere, and Mr. George Baker of Derby. The parent moths were all taken flying over or among *Melampyrum*

pratense, and the eggs were mostly deposited upon sprigs of this plant.

They hatched in about a week, and from the batch sent me by Mr. Baker I was fortunate enough to rear seven larvæ to full growth. The Rev. John Hellins, of Exeter, kindly supplied me with fresh flowers of *Melampyrum pratense* (which does not grow here at Drayton-Beauchamp, near Tring), every three days. Mr. Wm. Buckler, of Emsworth, has, with his usual skill, taken some very accurate and life-like coloured drawings; and both he, Mr. Hellins, and Mr. Baker have been fortunate enough to take the larvæ themselves on the flowers of the *Melampyrum* in their respective neighbourhoods. I cannot sufficiently thank these gentlemen, and Messrs. Barrett and Hodgkinson, for the kindness they have shown and the trouble they have taken in helping me to work out the economy of this interesting little insect.

I subjoin a description of the larva and pupa.

Larva somewhat short and stumpy, in shape resembling the larva of *Eupithecia isogrammata* Tr. Ground colour pale dull yellowish-green. Central dorsal line broad, uninterrupted, dull purplish-red, enlarged at the centre of each segment into a somewhat pear-shaped blotch. Subdorsal lines narrow, sinuous, dull purplish-red. Spiracular line yellowish, very faint. Spiracles blackish. Head yellowish, suffused with purplish-red. Central dorsal and subdorsal lines sometimes merged, leaving the back and sides suffused with purplish-red. Dorsal and lateral segments thinly sprinkled with slender yellowish hairs. Belly naked, pale, dull greenish-yellow. Central ventral line wanting. Subventral lines narrow, purplish-red.

Feeds on the flowers of *Melampyrum pratense* L.; when quite small on the stamens alone, but afterwards on the whole corolla-tube.

Full-fed from the middle of July to the middle of August. Reared from eggs sent me by Mr. George

Baker, of Derby, who took the parent moths on Breadsall Moor, near Derby.

Pupa either enclosed in a slight cocoon on the surface of the ground, or in a dry corolla-tube of the *Melampyrum*. Ground colour golden yellow, abdominal divisions and tip red. (H. Harpur-Crewe, 4th August, 1865; E.M.M., September, 1865, II, 90.)

EUPITHECIA PYGMÆATA.

Plate CXXXI, fig. 2.

Larva long, very slender, and tapering extremely on the capital segments. Ground colour pale, dull yellowish-green. Central dorsal line pale olive, connecting a series of very distinct, well-defined, urn-shaped blotches of the same colour, which become confluent on the capital and anal segments. Sub-dorsal and spiracular lines pale olive, sinuous, distinct, and rather broad. Belly without markings. Skin rough and rugose, freely studded with short whitish hairs.

In form and general appearance this larva comes next to that of *E. pulchellata*. It feeds on petals and anthers of *Stellaria holostea*. Full-fed 20th of June.

I am indebted to the kindness of Mr. J. B. Hodgkinson of Preston, and the Rev. John Hellins of Exeter, for the opportunity of describing this interesting and almost unknown larva. The former gentleman took a female moth on the 25th of May. She deposited three eggs on a daisy flower, which, together with the parent insect, he forwarded to Mr. Hellins. The eggs hatched on the 2nd of June.

Mr. Hellins kindly sent me a larva on the eve of its last moult. I had no *Stellaria holostea* within easy reach, but found it fed freely on petals and stamens of *Cerastium tomentosum*.

Mr. Buckler has secured several life-like portraits

of this interesting little stranger. (H. Harpur-Crewe, 21st June, 1872; E.M.M., August, 1872, IX, 65; and Entom., August, 1872, VI, 166.)

EUPITHECIA JASIONEATA.

Plate CXXXI, fig. 6.

On the 21st of September, 1879, came a moth bred about the middle of May, 1879, accompanied by two larvæ feeding in the seed-heads of *Jasione montana*, from Mr. Robert Ficklin, of Keynsham, near Bristol. The larvæ were said to be precisely the same as those from which the moth had been bred, with others like it to the number of about thirty. The larvæ were all taken on the same food growing in Devonshire in 1878. Mr. Ficklin stated that he sent one of the moths to the Rev. H. Harpur-Crewe, who thought it was a variety of *E. castigata;* but as Mr. Ficklin felt convinced it was not that species, he had gone after the larvæ into Devonshire again this year (1879), but was too soon for them, and he only got about two dozen very small ones, which have grown up to the size of those now sent to me; he sent two of the larvæ to Mr. Crewe, who advised him to send a moth to me, and one or two larvæ for me to figure. On the 26th of September Mr. Ficklin sent me six more of the larvæ and some dry seed-heads on which they were feeding; and in the meantime I had detected two more larvæ in the heads previously sent. Mr. Ficklin mentioned the seed-heads to be of some sort of scabious, and Mr. Harpur-Crewe spoke of them as *Scabiosa succisa*, and I readily believed they were until I gathered one or two to give to the larvæ, and then I saw at once that the larvæ were not on any kind of scabious heads; but after some delay, and reference to the plates of 'English Botany,' it soon appeared that they were the seed-heads of *Jasione montana*.

Mr. Harpur-Crewe and myself were both struck by

the great resemblance in the pattern or design on the back of these larvæ to that of *E. campanulata*, which seemed to correspond in every particular but that of size, these being so much smaller. Mr. Harpur-Crewe thought the moth was a nigrescent variety of *E. castigata*, but I soon saw that though all the lines were present as in that species, yet the paler spot at the anal angle of the superior wings was not present, and that there appeared to be a difference in the cut of the wings, *E. castigata* having a more produced tip and more convex hind-border than in this moth, which is of a cold grey colour, quite different from the brownish-grey of *E. castigata*.

The larva is about or nearly half an inch long, of moderate stoutness, and very rugose, tapering a little anteriorly from the sixth or seventh segment, and posteriorly from the tenth. The head is dark brown, marked with darker; the ground colour of the body varies in different examples from pale whity-brown to brown, lighter or darker, warmer or colder; beyond the thoracic segments to the ninth inclusive there is on each segment somewhat of a barrel-shaped mark of brown, thickly and strongly marked on each side of the shape with dark brown, or this may be described as a bulbous flask shape, the sides of the bulb thickly defined with *dark* brown, and a darkish brown dorsal stripe running continuously through all to the anal tip; on the tenth, eleventh, and twelfth segments the shapes are rudimentary; a fine dark brown subdorsal line runs close by either side of the dorsal shapes, and bears a dark brown thick mark or blotch close to the widest dark part of the flask shape, sometimes uniting with it, but these do not occur after the ninth segment; on the side of each segment is an oblique dark [word evidently missing in the MS.] downwards from the front towards the spiracular region; the belly is whitish cream-colour, with a central dark grey-brown ventral line; the tubercular warts bear each a fine dark brown central dot on their paler tint, and a short

stiff bristle. Each segment is subdivided by six deep transverse wrinkles, the first four wider apart than the other two; the segmental divisions are very deeply cut, the end of each segment swelling out in breadth beyond that of the beginning of the next; the surface of the skin being thickly covered with granulous points; the bulbs of the flask shapes or the barrels occupy but little more than the hinder half, if any, on each segment, so that the difference between the marks on this larva and those on the larva of *E. campanulata* is one of proportion.

Subsequently Mr. Ficklin informed me that he found these larvæ on the plants growing at an elevation of several hundred feet above the sea at Lynton, North Devon. (William Buckler, 26th September, 1879; Note Book IV, page 6.)

Some three years ago I received from Mr. Ficklin, of Keynsham, near Bristol, specimens of a *Eupithecia*, which he had bred from larvæ taken the previous September in North Devon, feeding in the seed-heads of *Jasione montana*. At first sight I was disposed to consider them a variety of *Eupithecia castigata*, and in this view Mr. Buckler, who also saw the specimens, concurred. I forbore, however, to give any definite opinion till I had seen the larvæ.

The same autumn Mr. Ficklin again took the larva in North Devon, and very kindly sent specimens both to Mr. Buckler and myself. We at once saw that they bore no likeness whatever to the larva of *E. castigata*, but, though smaller and stouter, most closely resembled that of *E. campanulata*. As, however, the perfect insect was totally distinct from the latter species, I felt convinced it must be a species new to Britain.

Through the kindness of Mr. McLachlan the perfect insect has recently been carefully examined by Herr C. Dietze, of Baden-Baden, who probably knows more about the Continental *Eupitheciæ* than anyone else. He is unable to identify it with any known

species, and considers it new to science. With the consent, therefore, of Mr. Ficklin, to whom the whole merit of the discovery is due, I propose to name it

Eupithecia jasioneata.

[Description of perfect insect omitted.]

The larva is short and stout; the ground colour pale ochreous-brown; the central dorsal line dull olive-brown, interspersed with lozenge-shaped spots of a similar colour; the latter become merged into the central line on the anal segments; the head is blackish; the spiracular lines are indistinct, yellowish on each side, with slanting brown markings. The whole larva is wrinkled, rough, and sparsely studded with yellowish warts and hairs.

It feeds in September on the seed-heads of *Jasione montana*. The perfect insect appears in May. (H. Harpur-Crewe, 6th August, 1881; E.M.M., September, 1881, XVIII, 80; and Entom., September, 1881, XIV, 198.)

Eupithecia lariciata.

Plate CXXXV, fig. 1.

A notice of the occurrence of this insect, hitherto undetected in Britain, has already appeared in the pages of the Entomologist's Monthly Magazine. A description, therefore, of the larva and pupa may not prove an unpleasant sequel. This I am able to supply through the kindness of Mr. Edward Hopley, who forwarded me a small batch of impregnated eggs, from which I reared nine or ten larvæ.

There appear to be two well-marked varieties of the larva.

Var. 1. Ground colour bright grass-green, somewhat darker on the centre of the back; central dorsal line dark green; anal tip of central dorsal line reddish; subdorsal line wanting, or so faint as to be scarcely visible; spiracular line whitish or pale straw-

colour; segmental divisions yellowish; belly whitish, with a dark green central line. A long and rather slender larva, tapering towards the head. It resembles in general appearance the larva of *Eupithecia fraxinata* Crewe.

Var. 2. Ground colour yellowish-red or reddish-buff; central dorsal line brownish-olive, occasionally very faint; anal tip of central dorsal line reddish; spiracular line pale greenish-yellow; belly whitish, with a dusky central and two broad lateral lines. In general appearance it much resembles the larva of *Eupithecia indigata* Hübn.

Feeds on *larch* and *spruce fir*. Full-fed at the end of July.

Pupa enclosed in a slight earthen cocoon, rather long and slender; thorax yellowish-olive; wing-cases deep green; abdomen yellowish-green, tinged with red; abdominal divisions and tip red. (H. Harpur-Crewe, 11th October, 1864; E.M.M., November, 1864, I, 141.)

EUPITHECIA IRRIGUATA.

Plate CXXXII, fig. 4.

Received 22nd June, 1870, from Mr. Thomas Hutchinson, who beat it from either oak or beech, both trees interlacing their foliage.

The larva when full-fed is barely three-quarters of an inch long, green, with the head dull purplish brown-red. A series of dull crimson or purplish red-brown dorsal marks at the segmental divisions, and a faint blush on the middle of each segment, as though these marks formed part of dorsal diamonds which had become obsolete or almost vanished except at the beginning and end of each segment; and at these parts are bordered with paler yellowish-green than the full green ground colour. The dorsal line on the thoracic segments is *pale* yellowish-green, bordered by purplish

brown. The subdorsal lines of the same colour distinct on these segments only, and are again faintly seen on the posterior ones. The ventral surface is green, same as the back; the abdominal and anal prolegs are tinged with purplish-brown. (William Buckler, June, 1870; Note Book I, 11.)

A larva received from Mrs. Hutchinson on the 10th June, 1871. On oak, reared from the egg.

The larva is elongate, of about equal size throughout. Ground colour bright rather yellowish-green. A series of dorsal purplish-red marks at the segmental divisions, something of a spear shape, but with the point cut abruptly off; the narrow part on the end of the segment in advance; the broadest part behind is on the commencement of the segment following; a very faint trace exists in a pulsating dorsal line more or less connecting them. The dorsal blotches are bordered on each side with bright pale yellow, a fine streak or line of purplish-red through the middle of the yellow. The lobes of the head are dull purplish-red, and the thoracic segments are marked with this colour; the subdorsal purplish-red line is distinct on these and then disappears, but reappears in the midst of the yellow at the segmental divisions. Beneath the puffed spiracular region at the end of each segment is a spear-point shape of purplish-red, but fainter than the rest and pointing forwards. The belly is of the same green as that of the back and sides, and has a central pale yellowish faint line. The legs and ventral legs are purplish-red, and a streak of the same is above each, connecting them.

The green of the larva is exactly the green of the oak leaves at this time.

By the 15th of June it had lost its beauty, and was scarcely to be recognised; and it retired to earth in the course of the day. (William Buckler, 15th June, 1871; Note Book I, 106.)

The larva is long, slender, and tapering slightly towards the head; the ground colour is dull yellowish-

green; the skin is rather rough and wrinkled; the central dorsal line is dull rusty red, very indistinct, except on the capital and caudal segments, enlarged on the centre of the median dorsal segments into a somewhat conspicuous elliptic blotch; the subdorsal and spiracular lines are yellowish, the latter very faint; the head is rusty red; the belly is greenish, without markings.

It feeds on oak, and is full-fed by the middle of June.

It much resembles the larvæ of *E. exiguata* and *E. consignata*, being exactly intermediate between the two.

I am indebted to the kindness of Mrs. Hutchinson of Grantsfield, and Mr. Buckler of Emsworth, for the opportunity of describing this almost unknown larva. It was bred from the egg by this most indefatigable of fair entomologists; and Mr. Buckler has, with his usual skill, secured a lifelike figure. (H. Harpur-Crewe, 19th June, 1871; Entom., July, 1871, V, 348.)

EUPITHECIA FRAXINATA.

Plate CXXXII, fig. 8.

Larva long, smooth, tapering towards the head. Ground colour uniform dull green. Segmental divisions yellow. Central dorsal line dingy green or purple, very indistinct, except on the anal appendage, where it is dilated into a large dark purple spot. Spiracular line yellow. Belly whitish, wrinkled; central ventral line dark green. A variety rarely occurs in which the central dorsal line is wanting, and its place is supplied by a series of dusky triangular blotches, becoming faint or evanescent on the anterior and posterior segments. On each side is a row of slanting yellowish stripes, tinged with pink.

Pupa enclosed in a cocoon under moss, on the trunks

of *ash*, long, slender, and tapering. Thorax and wing-cases dark olive. Abdomen still darker, almost black, tinged posteriorly with red.

Feeds exclusively on *ash*. The Rev. Joseph Greene and myself have for some years been in the habit of taking both larvæ and pupæ, and we never found them upon any other plant. The larvæ will eat flowers of *Laurustinus* if reared from the egg in confinement. It is full-fed at the end of August and the beginning of September. The perfect insect appears at the end of June and throughout July. (H. Harpur-Crewe, Ent. Annual, 1863, p. 120.)

EUPITHECIA DENOTATA = PIMPINELLATA.

Plate CXXXII, fig. 6.

This larva, in size and general appearance, closely resembles that of *E. fraxinata*. It is long, rather slender and tapering towards the head. There are two varieties.

Var. 1 is green, with three purple dorsal lines, the centre one broad and distinct, expanding considerably on the anal segment, the two side ones very indistinct. Head and prolegs purple. Segmental divisions and spiracular line yellowish. Belly green. Back studded with a few minute white tubercles, interspersed here and there with a black one.

Var. 2 is of a uniform purple, with two lines of a deeper shade on each side of the back. It feeds, as far as my experience goes, exclusively on the flowers and seeds of the lesser burnet saxifrage (*Pimpinella saxifraga*), and is full-fed throughout the month of September, and occasionally at the beginning of October. It prefers the hedge-sides and banks. It is fearfully infested with ichneumons, not above one in ten escaping.

The pupa is enclosed in an earthen cocoon; there

are two varieties, the one yellowish-brown, the other red.

The perfect insect appears at the end of June and in July.

The larva is by no means rare in the eastern counties; I have also taken it in Derbyshire. (H. Harpur-Crewe; Ent. Annual, 1861, p. 136.)

Var. 1 has the ground colour bright green, sometimes darker on the centre of the back; the central dorsal line is darker green; the subdorsal lines are paler; the anal tip of the dorsal line is crimson; the head is reddish; the spiracular line is pale green; the belly is green, paler than the ground colour; the segmental divisions are pale yellowish-green.

It resembles much the larvæ of *E. fraxinata* and *E. lariciata.*

Var. 2 is pale russet-green; the dorsal line is darker; the subdorsal line is slightly darker; the head is reddish-brown; the anal tip of the dorsal line is crimsonish-red; the spiracular line is yellowish, margined underneath with russet-brown; the belly is yellowish-green; the segmental divisions are paler.

Var. 3 is neutral crimsonish-red; it is paler towards the spiracular line; the dorsal line is madder-brown; the subdorsal lines are indistinct, reddish-brown; the head is reddish-brown; the tip of the anal segment is crimsonish-red; the spiracular line is pale straw-colour, margined underneath with neutral red; the belly is greyish; the segmental divisions are pale straw-colour.

Full-fed at the latter end of September.

It feeds on the seeds of *Pimpinella magna* and *P. saxifraga;* seems most partial to *P. magna*, upon which plant I have found the larvæ rather freely. The colour of the larva seems to assimilate with the seeds; the green ones upon green unripe seeds, and the red ones upon the purple ripe seeds. (William Prest, 16th September, 1872; Entom., November, 1872, VI, 240.)

EUPITHECIA INNOTATA.

Plate CXXXVI, fig. 6.

An Enigma.—In October, 1860, I beat for the first time a number of the larvæ of *Eupithecia succenturiata* from *Artemisia vulgaris*. This plant is rather abundant on one side of Exeter, but, as happens so often with species that feed on some tree or plant of common occurrence, the locality for the pugs is very limited in extent, and except on two sides of one field it is in vain to hunt for them, however tempting the mugwort may appear in other hedges. This spot I have visited in most years, but with varying success; latterly the greater care of the farmer in keeping his hedges pared has a good deal injured one's sport, and sometimes it has been difficult to get even a couple of larvæ, where twenty years ago fifty or sixty could be got easily. Together with *E. succenturiata* there have always been a few *E. absinthiata*, and now and again (of course) *E. castigata*, also stray examples of *Hemithea thymiaria*, and one or two other geometers; but last year (1883) there turned up what the late Mr. Buckler termed a "puzzler." I had sent him without examination the whole of my first take from the mugwort, but when, at his desire, I went a second time, and the larvæ had grown bigger, I found amongst my captures one that I could not determine; so when I sent it on I called his attention specially to it. In his reply he told me he had already detected a similar larva in the first consignment, which he had placed by itself for observation, and that he had at length come to the conclusion that it was something he had seen once before, but did not know what to call it. Dr. Knaggs had on one occasion sent him this larva (I presume from somewhere on the south coast), but the moth had not been bred.

For a time, therefore, we were very pleased at our

luck, and looked to be able to announce some species at least "new to Britain." But our hopes were not destined to be long-lived; one of these two larvæ my friend injured when changing its food, and the other gradually ceased feeding, and died of inanition, though it had been tried with various flowers, and had seemed for a time fonder of *Solidago virgaurea* than of the *Artemisia;* it was captured about the middle of October, and it lived on to the 21st or 22nd of November.

This year again I visited the locality on the 4th of October, and the first larva that fell into my umbrella (I got but a bare half-dozen of all sorts on that day) was another of these puzzlers; whether or not I hurt it I cannot say, any way I was soon spared any uncertainty, for after it was boxed it never fed, and in three or four days' time was dead, and I have not been able to find another.

In the hope that some one else may be more fortunate I send this note, with the following description of my this year's example:

Length 13 mm. Figure rather stumpy; skin rugose; ground colour rich creamy-white; head brown; the dorsal thread rather darker than the ground, and bordered throughout with strong streaks of full brown, which are widest just at the middle of each segment, and narrow where they meet at the folds; in the same way the brown subdorsal line varies in width, swelling out in the middle of each segment, and tapering to the folds; on segments 5 to 9 these lines, dorsal and subdorsal, are united at their broadest by a deeper brown suffusion, which leaves the fold pale, but encloses the front pair of pale trapezoidals, and is hollowed out behind on either side the dorsal line, so as to let the hinder pair of trapezoidals stand as the apices of two pale spaces extending to the fold, and altogether presenting something of the effect of a good fat **M**, supposing its middle **V** filled up; there is a redder-brown waved

line just above the spiracles, which stand on pale ground colour, and beneath them a darker brown suffused region fading off paler into the pinkish-white of the belly, and there is a central ventral line of brown.

E. expallidata perhaps comes nearest to this larva, but the difference is apparent on comparison, and the stranger belongs to a smaller species.

I am conscious my description does not express exactly what I see; however, Mr. Buckler made very careful drawings, both life-size and magnified, and Mr. Bignell has now very kindly figured two segments for me, and preserved the last larva; we have ample materials for identification, therefore, when the larva turns up again. (John Hellins, 15th October, 1884; E.M.M., November, 1884, XXI, 136.)

The Enigma Solved.—I gave above some account of a "pug" larva from *Artemisia vulgaris*, which Mr. Buckler and I could not identify. Mr. W. Warren, of Cambridge, now writes to tell me that, after reading my description of it, he has no doubt it was the larva of *E. innotata*. At p. 257 of Vol. XXII of Ent. Mo. Mag. Mr. Warren records the capture of four larvæ on *Artemisia maritima;* and in Vol. XXIII, p. 115, is the record of his exhibiting at the September meeting of the Entomological Society two specimens of the moth bred from these larvæ; they proved to be *Eupithecia innotata;* so, more lucky than myself, he has been able to identify his captures.

I suppose Mr. Buckler did not think of *E. innotata* for this reason; he had figured a Continental example of the larva for Mr. Harpur-Crewe in 1862, but certainly the variety submitted to his pencil was not much like that which I found. However, Mr. Warren tells me all his four larvæ varied from one another in appearance, so that *E. innotata* must be a species of which it is not sufficient to see a single larva.

Probably others may have taken this species in the larva state. Mr. Buckler remembered having received

an example from Dr. Knaggs many years ago, but Mr. Warren has now enabled us to add for certain *E. innotata* to the British list. It may be as well perhaps to add that the moth can scarcely be separated from *E. fraxinata*, although the two larvæ are distinct enough. (John Hellins, 1st March, 1887; E.M.M., June, 1887, XXIV, 10.)

[The following description, which seems to be the last ever written by Mr. Buckler, and is simply headed "Fig. 16. 1883. Eupithecia" is referable to these *Eupithecia innotata.*]

In October, 1883, I received two small larvæ feeding on flowers and seed-vessels, also on the leaflets of *Artemisia vulgaris*, from the Rev. John Hellins; the first, excessively small, came on the 28th of September, and the second on the 17th of October, scarcely so large as what the first one had then become. On the 22nd I figured the biggest, which was exactly six lines long, and rather deeply rugose; the head is dark greenish, finely dotted with black, and on the crown the lobes are margined with blackish. The ground colour is at first white, but at the date when figured it was yellowish-white. On the back is a series of dorsal diamonds of black at first, afterwards brownish-black, through which runs a dorsal line of warm greenish-reddish brown; the subdorsal lines are black and conspicuous throughout; a black spiracular streak puffed shows plainly the round spiracles of brown colour; the streak turns from black to green by degrees, and then gradually paler. On the dark dorsal diamonds the anterior pair of tubercular warts are brown with short dark bristle; the posterior ones are white warts, being on the white ground outside the diamonds. The markings on the front segments and on the four hinder ones are more linear modifications of the diamond forms, and are far from the black subdorsal lines. The ground of whitish at the posterior end becomes faintly tinged with greyish-green. At the beginning of each segment on the

back the ground is tinged strongly with greyish, but at the end of each is whiter. Some rough [a word illegible here] minute white dots at either end of each segment give a granulous effect. On the belly the ground is a pale whitish or bluish-green, with a central ventral line of black, and a *broad* black stripe bounds the ventral surface on either side.

At the end of October I tried the larvæ with seed-vessels of *Solidago virgaurea*, to which they at once took in preference to mugwort. Unfortunately while changing food a few days later one was accidentally killed, and the other continued to feed only on the *Solidago*. This larva lingered on until the 22nd of November and then died, not having grown at all since it became the size of the one figured; and it seemed not to have fed for several days, as no frass could be seen. (William Buckler, 22nd November, 1883; Note Book IV, 220.)

EUPITHECIA EXTENSARIA.

Our fortunate discovery, in 1887, of *Eupithecia extensaria* on this coast [Norfolk] was duly followed in September by the discovery of its larva feeding, as we expected, upon *Artemisia maritima*.

It is a pretty larva of a rather bright green with whitish longitudinal lines, the subdorsal and spiracular lines being broad, and one along the ventral area narrow. The spiracular line is also more or less edged below with pinkish-brown. Head green, with pinkish-brown mouth; legs also pinkish-brown, claspers green, swollen and glossy.

The entire larva is a *combined plan of mimicry*,—its body is striped precisely like the curiously grooved sprays and footstalks of the *Artemisia*, which exhibit, alternately, green skin and white down; the pinkish-brown mouth and feet, drawn together when the larva is at rest, exactly resemble the opening buds of the

plant, and the two pairs of tumid claspers at the hinder extremity resemble in an extraordinary degree the thickened rounded segments of the leaves. This last-named resemblance seems at first sight unnecessary, but its value is demonstrated by the discovery that this larva has a habit—which I have never observed in any other species—of standing apparently *upon its head*, that is to say, laying hold with its thoracic feet and extending its body stiffly, so that its hinder extremity is in the air. This, however, is only an occasional practice, and during the daytime it generally remains close to the stem, twisting itself among the leaves and blossoms, but at night feeding voraciously on both.

When full-fed it descends to the ground, where it makes a tough cocoon, and changes to a pretty stumpy pupa of a chestnut-brown, with bright green wing-cases.

The moths emerged in June and July, almost every larva producing an imago. Not a single parasite occurred among them.

This species seems to be gregarious or excessively local in its habits, frequenting sheltered clumps of the food-plant, but not extending its range very far, although the *Artemisia* is plentiful on the coast. This excessive localism may be habitual with the species, or it may be an indication that it is quite a recent immigrant to our coasts; and this last view I am inclined to favour, partly from the present immunity of the species from parasites, but still more from the circumstance that so acute and energetic a worker as Mr. Atmore had not previously observed it. He and I think it impossible that he should have so long overlooked it. I may add that from this gregariousness the species might probably be easily exterminated. (Charles G. Barrett, 9th March, 1889; E.M.M., April, 1889, XXV, 258.)

Since I found the larvæ of *Eupithecia extensaria* near Hunstanton at the end of August, 1889, I have

reared some hundreds of them, and a few notes, supplementary to Mr. Barrett's (Ent. Mo. Mag., April, 1889, XXV, 258) will probably be not without interest. The larvæ collected at large produced moths freely the following June, and I had no difficulty in pairing a number of them over a growing potted plant of *Artemisia maritima*, which I had had for some time awaiting their advent. Soon eggs were deposited in considerable numbers; they were placed singly, but often a number in close proximity, on the slender leaves of the food-plant, and each moth, after laying three or four eggs or so, would usually fly up from the plant to the gauze covering, to fly down again almost immediately to some other sprig, and continually repeat the same performance. No doubt its habit in the natural habitat would be to fly from sprig to sprig, and from plant to plant, in which case eggs from one moth might extend over a considerable area. The wonder, then, is that its habitat should be so exceedingly restricted, as it appears to be, on the Norfolk coast (see Ent. Mo. Mag., April, 1889, XXV, 258 and 398).

The egg is of fair size, oblong-oval, bright glistening orange-yellow. Those first deposited, about the 17th of June, hatched out in numbers on the 29th and 30th, and by the 4th of July all of them seemed to be out.

The minute newly-emerged larvæ were yellow, tinged with green. By the 14th July they were nearly a quarter of an inch long, pale yellow or greenish, and having faint indications of darker dorsal and subdorsal lines. A fortnight later, on the 28th, many of them had attained to five-eighths of an inch, were slender, and tapered a little towards the head. The colour was now bright green, a little freckled with white dots, the subdorsal and spiracular stripes clear white, but as yet with no indication of the pink colouring on the spiracular region which was so noticeable in the parent larvæ; head bright

green, the mandibles and also the tips of the anterior legs pale brown.

Prior to this time the growing plant of *Artemisia maritima* had been eaten away, and it being inconvenient to have to send to Norfolk for a fresh supply every time it was wanted (as I had done the previous autumn), I tried the larvæ with *Artemisia vulgaris*, and with the garden "southernwood," *Artemisia abrotanum*. Of the former they ate very little, but I was pleased to find that they took to the latter with evident relish, and I have never since had any anxiety as to their food-supply, having fed them exclusively on this plant.

On the 9th of August the largest larvæ were nearly an inch and a quarter long, and apparently full-grown, and by the 20th they were spinning up rapidly.

They were proportionately rather stouter, but the only variation in colour from the description made on the 28th July was in the subdorsal lines, which were not so white, being formed apparently of a white powdering, through which the green distinctly asserted itself; the spiracular stripes were still intensely white, as was also a ventral central stripe.

What surprised me very much was, that in the over four hundred larvæ I reared in 1890 not a single one showed the least trace of the pink marking so pretty and conspicuous in many of the captured larvæ of 1889, nor did it reappear at all in any of the larvæ of the succeeding generation I reared last year. The pink colour was of exactly the same tint, and evidently appeared simultaneously with the flower-buds of the *Artemisia maritima*, and is doubtless a good example of protective assimilation; whereas, the *Artemisia abrotanum* being always green (I have never seen it flower at all in Yorkshire), the appearance of the pink on the larvæ would have been not only useless, but disadvantageous. But that the larvæ should entirely lose every trace of it the very first season of

their altered environment was to me most extraordinary.

One of Mr. Barrett's observations, that the larva has an occasional habit of "standing apparently upon its head" (Ent. Mo. Mag., XXV, 258), I am not able to confirm. This statement seemed to me so remarkable, that I spent hours, during all parts of the day and well on in the night, besides requesting a number of friends, to whom I sent larvæ, to watch carefully, with a view to confirm it, but I believe none of us were able to do so. Possibly Mr. Barrett was not entirely mistaken on the point, but if not I am quite satisfied that the occurrence he noted was very exceptional if not purely accidental.

The cocoon is spun among the débris on the ground, or very often among the leaves or stalks of the food-plant; it is oval, toughly formed of brown silk, and rather small for the size of the larva.

The moths emerged in large numbers last June, and, so far as I could see, the changed food and modified colouring in the larvæ had not affected the imagines in any respect. From them I have now pupæ again, and so hope to still further experiment with the species during this year. (George T. Porritt, 14th March, 1892; E.M.M., May, 1892, XXVIII, 122.)

EUPITHECIA CAMPANULATA.

Plate CXXXII, fig. 5.

A short time ago Dr. Breyer, of Brussels, sent me a small publication in which he mentioned having found the larvæ of the above-named *Eupithecia* somewhat plentifully in the seed-capsules of *Campanula trachelium*, the "nettle-leaved bell-flower." As this plant is by no means uncommon in many parts of England, it seemed to me that there was no just cause or impediment why the insect should not occur as

well, so one afternoon in August I sallied forth into a wood not far from hence (Drayton-Beauchamp, near Tring, Buckinghamshire), where I knew the plant grew, and set to work to look for the larvæ of *E. campanulata*. Having gathered a few plants I knocked them against the sides of my umbrella, and soon saw a number of small pug larvæ crawling about which were totally unknown to me. Having made up my bag I returned home, and shortly afterwards enclosed two full-fed larvæ in a quill and posted them to Dr. Breyer, who forthwith returned answer that they were true and indubitable *E. campanulata*.

I have much pleasure in appending a description of the larva and pupa.

Larva rather short and stumpy, belonging to the *absinthiata* group, and resembling in general appearance the larva of that species and of *E. minutata*. Ground colour light ochreous-brown; central dorsal line very deep brown or black, intersecting and uniting a chain of very strongly-defined black or deep brown lozenge-shaped spots placed in the centre of each segment; subdorsal lines very slender and faint, blackish or deep brown; head dingy brown or black; spiracular and central ventral lines dingy black or brown; central dorsal spots becoming confluent and merged in the central line on the anterior and posterior segments; both spots and ground colour varying considerably in intensity of colouring; skin rough and wrinkled, and sprinkled with a few whitish hairs.

It feeds upon the unripe seeds and seed-capsules of *Campanula trachelium* L. Till nearly full-grown it lives either in the dry corolla-tube or just at the crown of the capsule. In confinement it will feed upon garden species of *Campanula*. It is full-fed at the end of August and the beginning of September.

The pupa is enclosed in a slight earthen cocoon. The thorax and wing-cases are golden yellow; the abdomen is reddish; the abdominal divisions and tip

red. It is similar to the pupa of *Eupithecia expallidata*. (H. Harpur-Crewe, 11th October, 1864; E.M.M., November, 1864, I, 142.)

EUPITHECIA SUBCILIATA.

Plate CXXXIV, fig. 5.

One larva from a batch of eggs laid by a female sent by Mr. John Sang, of Darlington, to the Rev. H. Harpur-Crewe, and this, the only surviving larva of thirteen, arrived on the 3rd of May, 1872, feeding on maple, having been reared on this food from the egg.

The larva was half an inch long, and stout in proportion, in its form resembling that of *E. tenuiata*. At this time it is of a tender green, matching exactly that of the young leaves of the maple. It is rather sluggish, and rests generally with its smallish head almost withdrawn into the second segment, which is then tucked under after the manner of *Lobophora polycommata*. The ninth segment is perhaps the thickest, and from thence to the anal extremity it tapers just a little, and also from the fourth to the head, which is much smaller than the second. The segments have four transverse wrinkles on the hinder half of each of them. At this green stage, in its last skin, the dorsal stripe is of a very dark green, thick at the segmental divisions, but fading and attenuating towards the middle of each segment. The subdorsal region is defined by the rather concave border of a pale triangular mark at the fore part of the segment, attenuating to a mere line at the hinder part, and a tubercular dot of the green ground colour is seen on the paler triangular mark. On the side a little below is a paler short and oblique streak at the beginning of each segment, but it soon vanishes in the ground colour. Beneath this along the spiracular region is a broader stripe of paler, and inflated with a slight

undulation. The spiracles are pale flesh-colour. The head is of a paler tint than the green of the body, and inclining to brown, and there are a few reddish-brown freckles on each side below.

May 7th.—A great change has come over this larva, without its having grown but a mere trifle in length. It has become thicker and plumper-looking. The ground colour is of course green as before, but the paler markings are deepened so as to be less conspicuous; the area of the back is rather suffused with dull purplish-red, as though it had run from the dorsal stripe, which is now of this colour, but otherwise as before. The triangular marks on each side of it have disappeared, and the subdorsal region is marked by a rather undulating faintly paler greenish stripe, closely followed beneath by a darker rather purplish-red suffused line; the spiracular region as before. The short tubercular bristles, pale greenish, are only visible with a microscope, as also the minute shagreened texture of the skin.

May 8th.—The larva is more generally suffused with pinkish, and has just begun to spin.

The moth, a female, from this larva, appeared on the 1st of August.

Several larvæ, all similar to the above, were beaten from maple in blossom during May, and sent me by the Rev. H. Williams, of Croxton, near Thetford; the moths from these appeared from the 13th to the 27th of July, 1872. (William Buckler, July, 1872; Note Book I, pp. 168, 169.)

On the 21st of May, 1876, Mr. J. P. Barrett, of Peckham, collected a number of larvæ of *Eupithecia subciliata* from maple flowers at Box Hill, part of which he very kindly forwarded to me.

Larva in length about five-eighths of an inch, and rather stumpy; the head has the lobes rounded, is smooth and polished, and is considerably narrower than the second segment. The body is cylindrical, plump and obese in the middle, but attenuated at the

extremities; the skin seems tough, and the segments being transversely wrinkled give it a puckered appearance.

There are two well-marked varieties, which, judging from those sent me, are about equally common.

The form we will take as var. 1 has the ground colour yellowish-green, the green colour being strongest on the anterior segments; the head is almost green; a deep purple broad stripe, still darker at the segmental divisions, forms the dorsal line; a pale shade of purple is also suffused rather broadly on each side of the dorsal line; the subdorsal lines are greyish-white; there is an equally pale waved stripe above the spiracles, and a pale but greener stripe along the spiracles. The ventral surface is uniformly dingy green.

Var. 2 has the ground colour bright yellowish green, the head tinged with brown; a dark green pulsating vessel forms the dorsal line; subdorsal lines greyish-white; there is a similarly coloured waved line above the spiracles, and a pale greenish stripe along the spiracles; the segmental divisions are yellowish. The ventral surface is uniformly bright pale green tinged with yellowish.

At the end of the month these larvæ spun up between the leaves and amongst the flowers of maple.

The pupa is scarcely a quarter of an inch long, and somewhat stumpy; it is smooth and polished, rounded on the upper side, and has the wing-, antenna-, leg-, and eye-cases prominent. The colour is pale brown, with the segmental divisions darker and the wing-cases yellowish.

The imagos appeared early in August. (George T. Porritt, 5th July, 1877; E.M.M., August, 1877, XIV, 68.)

EUPITHECIA TOGATA.

Plate CXXXVI, fig. 1.

On the 5th July, 1871, I received from Mr. A. H. Jones five eggs of this species, which had been given him by a friend who had taken the moth in Scotland.

The larvæ hatched on the 9th, and, as I understood the moths were beaten from the spruce fir, I supplied them with twigs of spruce, as well as some knotgrass and a few flowers, such as those of ragwort and golden-rod. Two or three of the larvæ nibbled a little at the flowers and knotgrass, but soon dwindled and died. The other two attacked the spruce, *burrowing into the buds* which studded the ends and sides of the young shoots, but unfortunately, in my attempt to watch their proceedings, I injured them, so that they both died.

However, early in July of the present year (1872) Dr. F. Buchanan White, by dint of hard work, obtained some eggs, some of which he kindly sent to Mr. Buckler, from whom they passed into my hands. Eight eggs reached me safely, and the larvæ hatched on the 18th of July. Being now sure of the proper food, I gave them no choice, putting in only bits cut off from spruce shoots which were furnished with buds. As before, three of the larvæ failed to find out their food in time, and were starved; the other five fed away at once, but instead of attacking the buds, commenced operations by *tunnelling into the inner bark or liber at the cut ends of the shoots;* they never touched the outer bark or the needle-like leaves, but ate their way onwards—in some cases for an inch or more—through the liber, until they reached a bud, into which they then burrowed. They ate rapidly, and their frass accumulated in proportion, some of it being extruded at the mouth of their tunnels, but

they gave no other sign of their presence. How they would act in nature I cannot say,—whether they would ever open an outward passage, and so travel from bud to bud, or whether they would remain quite hidden after their first entrance; but I am sure each individual eats enough to destroy all the buds on a long young shoot by the time it becomes full-grown. I left my larvæ undisturbed for some time, but about the 6th of August I saw one of them come out of its tunnel and walk restlessly about; I then carefully examined all the other tunnels, but could find only one other larva, and that apparently dead. I now put in a fresh supply of spruce, placing both the living and the dead larvæ on it, and when I next looked I found the former busily engaged in finishing up the remains of its defunct relative; I concluded, therefore, it had also been the cause of the disappearance of the others, owing, perhaps, to its being deprived of tender food by the drying up of the juice of the spruce buds. After this it fed away steadily on spruce, and moulted thrice, and on the 19th of August I sent it to my friend the Rev. H. Harpur-Crewe; from him it was sent to Mr. Buckler, and fed away until the 25th of August, when it began to hide itself in some peaty soil with which it had been supplied; on the 26th it disappeared totally, and by this time is, I hope, in the pupa state. It was supplied with bits of spruce shoots and bark, but it seemed to take naturally to the soil for pupation, so that it is probable that in nature it would eat its way out, and drop or crawl to the ground; and the pupæ should be looked for at the foot of the trees.

The egg is very broadly ovate, much wider, although but little longer, than that of *E. castigata;* it is straw-coloured at first, afterwards becoming bright vermilion.

The young larva when first hatched is something of the colour of the bark of a spruce shoot, being pale olive-brown; the head, plate on the second segment,

and anal tip being hard shining black. Under a lens all the warts come out distinctly,—black and shining, and furnished with hairs. After a moult or two the colouring becomes much as it continues up to full growth, and the whole appearance of the larva—both in figure and tint—makes one see at once that it is an internal feeder, and at the same time very little like the larva of any other *Eupithecia* on our native list. (John Hellins, 31st August, 1872; E.M.M., October, 1872, IX, 113; also William Buckler, June, 1873, Note Book I, 192, who adds that a female moth emerged on 13th June, 1873, and that this was the first larva ever seen and reared, and the moth the first ever bred in this or any other country.)

Description.—General colour dull pinkish-brown. Central, dorsal, subdorsal, and spiracular lines whitish, indistinct, especially the two latter. Skin wrinkled; body sparsely studded with black tubercles and short hairs. Head and collar horny and glossy, dusky brown.

An odd, internal-looking animal, strongly resembling a miniature *Cossus ligniperda*.

Feeds inside the buds and young shoots of spruce fir.

Hatched on the 18th of July. Full-fed the last week in August.

I am indebted to the kindness of the Rev. John Hellins, of Exeter, for the opportunity of seeing and describing this hitherto, I believe, undescribed larva. Mr. Hellins reared it from the egg. Mr. Buckler has succeeded in taking its portrait. (H. Harpur-Crewe, 2nd September, 1872; E.M.M., October, 1872, IX, 114.)

On the 6th of September, 1875, Sir Thomas Moncreiffe, Mr. W. Herd, and I started for a locality where *Eupithecia togata* has occurred tolerably freely, with a resolute determination not to return home till we had found the larva and made ourselves thoroughly acquainted with its food-plant and habits. The perfect insect always occurs in the neighbourhood of

spruce fir trees; to the spruces we therefore directed our attention. Long did we carefully scan the twigs; diligently did we beat the boughs, but all in vain. "Bother the larvæ!" we all exclaimed. We stood together racking our brains, and staring up into a tall spruce. "I've got it!" we almost simultaneously cried out; "they are in the cones." "I'll go up," said Mr. Herd; and up he went, and soon began to pelt us with cones. Amongst them were several from which a copious quantity of fresh frass was protruding. These were quickly laid open with a sharp knife, and very soon a lively, fat, pinkish-looking larva, very like a miniature *Cossus ligniperda*, was disclosed to view, which I at once recognised to be *Eupithecia togata* from a beautiful drawing which Mr. Buckler executed for me several years ago, from a larva reared on young shoots of spruce, from eggs laid by a captured female. A further search revealed sundry other larvæ; in one fresh-fallen cone we found no less than seven of various sizes. They feed between the scales of the cone, upon the ripe seed at the base.

The larva is a uniform dull pink, more or less clouded and spotted with black on the dorsal segments. Some of the smaller and younger specimens were very dingy. The head is black, with two small white dots at the base; on the neck are two conspicuous black dots.

When full-fed it quits the cone, and spins a slight cocoon on the surface of the earth.

The pupa is bright red, and resembles that of *Eupithecia subfulvata*.

Another somewhat similarly coloured larva, apparently that of a *Tortrix*, feeds inside the cones in company with that of *Eupithecia togata*. Sir Thomas Moncreiffe believes it to be *Asthenia strobilella*. (H. Harpur-Crewe, 1st November, 1875; E.M.M., December, 1875, XII, 157; and Entom., December, 1875, VIII, 297.)

On the 8th of September, 1875, I received from the Rev. H. Harpur-Crewe, while he was at Moncreiffe House, Bridge of Earn, larvæ of this species, mining within a spruce fir cone. He, in company with Sir Thomas Moncreiffe and Mr. Herd, had gone to Dupplin on the 6th, resolutely determined to find the larva in a state of nature, which they did. After much beating and searching in vain they unanimously came to the conclusion that it fed in the cones of the spruce fir, and Mr. Herd ascended to the top of the tree, and soon threw down cones from which resin and frass were protruding; and further examination revealed the larvæ of *E. togata* in situ. Only a few larvæ were collected on this occasion, as it was getting towards the close of the day before the discovery was made. The best find was in a single cone which had dropped under a tree, and was full of frass and contained seven larvæ; of these Mr. Harpur-Crewe sent me four, and a part of the cone to be figured, showing some of the holes in it excavated by the larvæ, and also a quantity of frass. The larvæ of these which I figured lived four or five days before pupating; the others spun up on the second and third day after their arrival.

Two moths emerged on the 3rd June, 1876. (William Buckler, 3rd June, 1876, Note Book III, 35.)

EUPITHECIA PUMILATA.

Plate CXXXVI, fig. 2.

On the 6th to the 9th of June, 1874, I received and figured three larvæ of *Eupithecia pumilata* found by the Rev. John Hellins feeding on flowers of holly. The most mature one was quite white, having but a faint greenish dorsal line; the head was brown, on each lobe marked with darker brown. The next largest was of a pale ochreous-brown tint with darker brown markings, consisting of a dorsal line running

through a series of prong-like marks, one on each segment from the fifth to the tenth inclusive; the space within the prongs more or less suffused or filled up with darkish brown; on the anterior and posterior segments the markings become merged into the dorsal line in somewhat of a lozenge or shuttle shape; two lines of brown rather close together run along the subdorsal region, the lowest being broad, and a central line of broad lozenge shapes of faintly darker brown is on the belly. The head [description abruptly ends].

The imago from the first-mentioned whitish larva appeared on the 30th June, 1874; it was a female. (William Buckler, July, 1874; Note Book II, 69.)

COLLIX SPARSATA.

Plate CXXXVII, fig. 1.

On the 18th of August, 1877, I received from Mr. F. D. Wheeler, of Norwich, a dozen larvæ of *Collix sparsata*. They were of various stages of growth, but in a few days the largest were full-grown, when I described them as follows:

Length nearly an inch, and of average bulk in proportion; head rather flattened above, but rounded on the sides; it is slightly narrower than the second segment, into which it can be partially withdrawn; body cylindrical and of almost uniform width throughout, tapering only a little from the eleventh to the thirteenth segments posteriorly, and from the third to the head anteriorly; skin smooth and soft, having a few almost imperceptible very short hairs. Ground colour bright pale green, the head pale brown; a green pulsating vessel showing between a double whitish line forms the dorsal stripe; subdorsal lines also whitish, and there is another whitish line below them, but some distance above the spiracles; below the spiracles is a conspicuous broad stripe, whitish

with a very faint blue tinge; segmental divisions yellowish; spiracles black; ventral surface almost uniformly pale green.

Feeds on *Lysimachia vulgaris*.

Before the middle of September all the larvæ had spun up; the cocoons were formed on the bottom of the cage, and were tolerably firmly constructed of silken threads.

The pupa is polished, about three-eighths of an inch long, and tolerably plump; it is of the ordinary shape, thickest at the ends of the wing-cases, and tapers rather suddenly to the anal tip; eye-, antenna-, and wing-cases well defined. Colour of the abdominal segments rather pale brown; head, thorax, and wing-cases green.

The first imago emerged on the 11th of June following. (George T. Porritt, 4th January, 1879; Entom., February, 1879, XII, 58.)

Lobophora hexapterata.

Plate CXXXVII, fig. 3.

For several years I had been keeping by me a description of the larva of this species, taken from specimens beaten by myself, or sent to me by friends at various times, but it was not until 1875 that I was enabled, by the kindness of Mr. A. H. Jones, to describe the egg also.

I received some eggs on the 30th of May; the larvæ hatched on the 1st of June, were full-grown in about four weeks, and spun up during the first week of July; captured larvæ usually spun up a week or so later. I am convinced from experience that aspen, *Populus tremula*, is *the* food, and though the larva will, for a time, eat other species of poplar, it will not thrive on them.

The egg is broadly oval in outline, flattened, and laid on its side; the shell shining, and covered all

over with delicate hexagonal reticulations; the colour at first pale green, afterwards whitish.

The young larva is at first pale dull white all over, afterwards becoming greenish.

When full-fed the larva is about three-quarters of an inch long, its figure rather stout, of even bulk, cylindrical, but showing to the eye as if almost squared; this appearance seems to be caused, first, by the absence of a dorsal line, for the pulsating dorsal vessel is scarcely to be seen without a lens, and so the eye catches the subdorsal line as forming the edge of a flat back; and secondly, by the habitual position of the larva, which, when at rest, contrives to lie perfectly flat on the surface of a leaf, somewhat in the fashion of those species which spin leaves together, though in this case I have never detected any spinning whatever; the lobes of the head are horny, and well defined; the hinder segments taper a little, and there are two short anal points; the skin is somewhat wrinkled; the ground colour is pale yellowish-green; the head is dull pale green with small black ocelli, the mouth reddish-brown; the subdorsal line (the only ornamentation) is pale yellow; below it the side is more yellowish-green in tint than the back; the spiracles very indistinct, pale yellow; the belly whitish-green; the segmental folds yellowish when the larva is at rest, when it is in motion they appear green; the anal points pinkish-white; altogether this is a very dull-looking larva, having so little variety of colour.

When spinning, it makes a neat cocoon, three-eighths of an inch long, and just half as wide, compactly woven of dark silk, with fine grains of earth, etc., stuck over it.

The pupa is five-sixteenths of an inch long, cylindrical, the eyes prominent, the abdomen about one-third of the length and tapering off in a curve, and ending in a bifid spike; the colour on the thorax and wings very dark greenish, on the abdomen deep red-

dish-brown; the skin rather glossy. (John Hellins, 12th January, 1877; E.M.M., April, 1877, XIII, 249.)

LOBOPHORA VIRETATA.

Plate CXXXVII, fig. 4.

On looking over the scanty records of this species for the last twenty years, I find nothing to show that it has more than one brood in the year, or more than one food-plant, viz., privet, for the larva. In the belief, therefore, that some further light on its history may be desirable, I have here put together the few facts which within the last two seasons have become known to me, and which go to show that *Lobophora viretata* must at least be partially double-brooded, the flights being in May or June and again in August, and that, as is generally seen in the case of double-brooded species, the *moths* of the first flight from hybernated pupæ are larger specimens than those of the second flight, and also that the larva is by no means confined to one food-plant.

On the 12th of July, 1875, I received from the Rev. Bernard Smith three larvæ which had been found by him each in a slight web amongst flower-buds of *Ligustrum vulgare;* they continued to feed three days longer, eating, as I observed, the interior of the flower-buds, portions of the leaves, and the rind of the flower-stalks; on the 17th they were spun up, the moth appearing on the 20th of August.

Mr. G. F. Mathew also informs me that at the end of last May and through June he was feeding up some *Ptilophora plumigera*, and that whilst providing them with fresh food he occasionally noticed between united leaves at the ends of the sycamore twigs some small geometers, but that taking them to be only *Cheimatobia brumata* he threw away most of them; after the *P. plumigera* larvæ had gone to earth he left

the cage to itself, introducing no other larvæ, but one day, about the middle of August, he looked into it to see that all was right, when he was astonished to discover two perfect specimens of *Lobophora viretata* evidently just out, and a day or two afterwards to find a third specimen, and thus became aware of the identity of the little larvæ he had been previously throwing away. With both of us, therefore, *Lobophora viretata* proved double-brooded in confinement; that it is double-brooded also in nature I obtained evidence on the 8th of September, 1875, when a friend, who was with me helping to search for larvæ of *Lycæna argiolus*, found a very different larva sitting in the midst of a small umbel of blossom-buds of *Hedera helix*, which was surrounded with a very thin and transparent open-meshed web; several of the buds were eaten out and a few grains of frass were clinging to part of the web. I felt a little puzzled for a few hours about this larva, which then had no marking, and was like the ivy-buds in colour when first found; but a subsequent examination convinced me that it was *Lobophora viretata;* it moulted on the 13th, and continued to feed well on ivy-buds until the 21st of September, when it burrowed into the earth, and the moth, a fine male, appeared early in the morning and was flying round its cage in the afternoon of the 6th of May, 1876.

The full-grown larva is about half an inch in length, or a trifle more when stretched out, thick and stumpy in aspect, the head fitting partly within the second segment, which is smaller than the third and fourth, they being tumid both above and at the sides; the last two segments a little taper to the end, which has two minute anal points; all the segments are plump, yet having two or three transverse wrinkles at each end, though not very noticeable till the larva is full-fed; the minute tubercles are warty; when the larva is at rest, and often while feeding, the head is tucked under the thoracic segments, which are arched

above, and from them again the back is arched to the end of the tenth segment.

Individual examples vary in details of colouring, though the ground colour is always some pale green or tint of greenish; in one variety the head and thoracic segments are much suffused with pink, and on the fourth segment a lateral wedge-shaped transverse streak of darker pink extends from behind the legs upwards; from thence each segment to the ninth has on the middle of the back a broad trilobed mark of dark pink, connected in the short intervals by a stout dorsal line of the same colour; on the back of the tenth the pink marking is more rudimentary, and on the three posterior segments is little more than a dorsal and imperfect subdorsal stout line, which all merge together at the anal tip; along the pale greenish side is a faint and interrupted pinkish line, and on it the small tubercular warts are whitish; elsewhere they are the same colour as the surface whereon they happen to be, and so are not noticeable; this is the case also with the spiracles.

A second variety has the ground colour very pale and slightly glaucous in its delicate tint, though strengthened a little in depth anteriorly; the dorsal mark on the third and fourth segments is a line of purplish-pink which occurs again on the last four, while on each of the intermediate segments is a purplish-pink broad-arrow mark with its point close to the division in front, extending backwards about two-thirds of the length of the segment, the ground colour of the remaining third being rather paler than usual; these arrow-heads are deepest in colour and rather suffused on the fifth and sixth segments, and each one following is more distinct and paler by degrees; the subdorsal line is of the same pink colour, distinct and continuous throughout.

A third variety I found in the autumnal larva before mentioned, which, previous to its last moult on the 13th of September, was of precisely the same

tint as the young ivy-buds amongst which it was found, and destitute of any markings; but afterwards, though it retained the same pale greyish-green ground colour, it became conspicuously marked with dark crimson on the head, more faintly on the second segment, where there was a dorsal line of the ground colour, and large crimson blotches on the back of the fourth and fifth segments, in which dorsal and subdorsal lines could be seen of still darker crimson; a part of these blotches extended transversely down the side and round the belly on the junction of the fourth and fifth, and nearly so on the junction of the fifth and sixth; whilst towards the end of the sixth, seventh, and eighth segments on the dorsal division of each was a large and broad crimson, somewhat blunted, diamond-shaped blotch, edged behind with whitish; at the division of the ninth and tenth segments were three short and very fine crimson streaks on the dorsal and subdorsal regions; the eleventh was without marking, the twelfth crimson with ground-coloured dorsal and subdorsal lines, and the thirteenth crimson, the anal flap edged with ground-colour, the front of the anal legs tinged with whitish, which continued down them as a stripe dividing a dark crimson blotch, from which proceeded a small dash forwards on each side of the belly; the skin was soft and velvety, the head only glossy.

The larva spins itself up in a cocoon about three-eighths of an inch in length by about a quarter of an inch in breadth, of a roundish oval figure, attached to a stone, a leaf of the food-plant, or other substance on the surface of the earth or a little below it, and composed exteriorly of grains of earth, and smoothly lined inside with silk.

The pupa is plump-looking, about five-sixteenths of an inch in length, and nearly an eighth of an inch in diameter in the thickest part, namely, across the ends of the wing-covers, which are long in proportion and well developed, having the rays in slight relief; the

thorax rounded near the head; the eye-covers prominent; the abdomen rough with fine punctured depressions except at the divisions, and tapering rather sharply towards the tip, which is furnished with several fine curved-topped bristles, the two central the longest; its colour is a dark brownish olive-green on the back of the abdomen, with brown divisions, and a darker brown dorsal stripe becoming reddish near the tip; the wing-cases are darkest between the rays, together with those of the antennæ and legs bright olive-green, eye-covers brown, the whole surface rather shining. (William Buckler, 23rd October, 1876; E.M.M., January, 1877, XIII, 185; and Note Book III, 7.)

THERA JUNIPERATA.

Plate CXXXVIII, fig. 1.

On the 16th of August, 1872, I received several larvæ of this species from Dr. F. Buchanan White, then at Eastferry, Dunkeld.

They were feeding on juniper.

The full-fed larva is nearly five-eighths of an inch long, tolerably uniform in size throughout, cylindrical, the thoracic segments generally a little arched when at rest, and the head bent inwards; the anal flap is rather pointed, and shuts down between two rather blunt and small points that project from the body below. The head is greenish, more or less suffused with pink, the anterior legs also deeply suffused with reddish-pink; the colour of the back, from one subdorsal pale yellow stripe to the other, is a delicate whitish blue-green with a faint darker dorsal line; the spiracular inflated stripe of yellowish-white is tinged in a particoloured way along each segment, i.e. whitish, yellowish, and pinkish, but in some of the larvæ it is wholly whitish, in one or two whitish at each end, and yellowish in the middle of a segment. The space along the side

between the subdorsal and the spiracular stripe is bright yellowish-green, having a meandering line of deep red close to the spiracular stripe. The belly is of a paler yellowish-green than the sides, with a central pale yellow or a whitish stripe, and a very faintly paler line than the ground is on each side of the ventral surface. The spiracles are blackish, ringed with reddish, but excessively small. N.B.—The subdorsal yellow stripes approximate towards the anal points.

N.B.—The meandering line of red above the puffed spiracular stripe of the larva is sometimes only a blotch or two of red.

N.B.—The yellow subdorsal stripes are bordered above by a stripe of the yellowish-green of the sides, but merge softly and gently into the whitish blue-green of the back.

The pupa is five-sixteenths of an inch in length, moderately uniform in bulk, not very stout, wing-cases long. At first its colour is bright yellowish-green, bluish-green on the back, and the subdorsal yellow stripes distinct as in the larvæ; but in a few days it changes colour to a dark olive-green broadly banded across the abdominal segments with black, but the subdorsal yellow stripes still remain distinct; the head and thorax are marked with black, and the wing-covers are blackish-green.

One moth appeared on the 27th of September, one on the 28th, and one on the 2nd of October, 1872. (William Buckler, October, 1872, Note Book I, 194.)

THERA CONIFERATA.

Plate CXXXVIII, fig. 2.

Notes on the respective Larvæ of Thera simulata [*T. coniferata*], *T. obeliscata* [*T. variata*], *and T. firmata.*—The larvæ of these species have all been described before, but the object of the following notes, carefully

made by Mr. Buckler, is to bring together their distinctive marks more fully.

They are all shortish smooth loopers, coloured with various tints of green.

Thera simulata (*T. coniferata*).—The larva is about five-eighths of an inch in length, stouter than that of the other species. The head is yellowish-green; the back pale greenish-blue; the dorsal line slender, of dull grass-green; the subdorsal stripe of the same colour; below this comes a white stripe, and then a broad stripe of the dark green, reaching to the spiracles, and there edged with dark brown; between this and the legs is a pale yellowish stripe; the legs are greenish.

(For the descriptions of the other two species, see under *T. variata* and *T. firmata*.)

(John Hellins, 23rd January, 1867; E.M.M., May, 1867, III, 277.)

THERA VARIATA.

Plate CXXXVIII, fig. 3.

The larva of *T. obeliscata* (*T. variata*) is the same length as that of *T. simulata* (*T. coniferata*); the anal segment is pointed, and very minutely bifurcated at the extremity; the head bent under, in colour green; the back bluish-green; the dorsal line darker green, and edged with lines paler than the ground colour; the subdorsal line commencing on the second segment as a yellowish-white line, then widening into a broad stripe, and assuming a blue tinge edged with white, till the tenth segment, when it contracts, and assumes the yellowish tint again; below the spiracles a fine yellowish-white line, but broader at each end; the belly green, with a central yellow line, and on either side an indistinct whitish line. Legs tinged with red. (John Hellins, 23rd January, 1867; E.M.M., May, 1867, III, 278.)

THERA FIRMARIA.

Plate CXXXVIII, fig. 4.

The larva of *Thera firmata* is the same length as that of *Th. simulata* (*coniferata*); the anal segment is decidedly forked; the head slightly bent under, red, with a brown streak over each lobe. Ground colour dark bluish-green; dorsal line of a much darker tint of the same; the subdorsal whitish, fine and uniform in width, quite white on the second segment; below the spiracles is a fine whitish line, tinged with yellow on the hinder segments; the belly green, with three equidistant pale lines. (John Hellins, 23rd January, 1867; E.M.M., May, 1867, III, 278.)

YPSIPETES RUBERARIA.

Plate CXXXVIII, fig. 5.

On the 9th of June, 1888, I took a female of *Ypsipetes ruberaria*, which I put in an inverted bell-glass containing a sprig of sallow in water, and covered with leno. In the course of two or three days it had laid on the upper side of the leno, by protruding its ovipositor through the holes, about ninety eggs. In the case of a female taken last May the eggs were chiefly laid on the central stalk of a female sallow catkin, which would seem to be the natural laying-place of this species, as it was also utilised by a female which my friend Mr. H. W. Vivian bred from some pupæ I gave him in 1889.

The egg is oval in shape, generally a little broader at one end than the other. The top and bottom are rather flattened, so that the height of the egg is nearly the same all over, except close to the sides, which are consequently rather straight. The whole surface is

covered with small irregular depressions, generally hexagonal, pentagonal, or oval, of which there would be about thirty along the edge of a median transverse section. The egg is whitish when first laid, and after a day or two becomes pinkish in tinge, the ridges between the depressions being here and there marked with blotches of darker pink, which increases the general pink tinge when the egg is seen with the naked eye.

The larva, when first hatched, is remarkably lively, crawling very fast; it is difficult to keep in confinement, as it seems to be able to get out of almost anything; after a day or two, however, it settles down to its food (sallow), and gives no more trouble. It seems to like best the under-side of a sallow leaf, especially of a stipule, as a place of residence, spinning thereon a white silken covering for itself, on the outside of which it sticks the down from the leaf, thereby making its abode very inconspicuous. In its earlier days it is gregarious in its habits, several larvæ living under one covering; as it grows older it becomes more solitary, though, even up to the time of its being full-fed, two will often inhabit the same house. In its older stages it generally draws two leaves together and lives between them, or sometimes makes its home by folding over a part of a leaf. It rests with its head curled round to its tail, and it is remarkable how small an abode one or two good-sized larvæ seem to find comfortable. At night it sallies out and feeds upon its own or the neighbouring leaves, but not on the part it has spun over. It remains nearly full-fed for a very long time before it forms its cocoon; most of my brood appeared to be full-fed early in September, and on the 25th of October there were still some that had not spun up for pupation. The larva descends to the surface of the ground about the middle of October, and there spins a tough cocoon of silk mixed with small pieces of earth and rubbish, in which it shortly turns to a pupa. In one or two cases the larva spun

up and turned between the sallow leaves, but this was not at all of frequent occurrence.

When quite young the larva is rather transparent, pale greenish, with a ringed appearance, owing to a very distinct dull red transverse band on the back of each segment, and with a dark brown head and plate on second segment, which become lighter with successive changes of skin. The markings on the body become less defined at each change, and gradually more marbled with ochreous, the red bands soon losing their definite outline and becoming more suffused over the whole segment, except the folds where the segments unite, which remain green.

The description of the larva in its last stage is as follows:—Length about one inch; rather stout, tapering very slightly towards the extremities. The head is rather flat, the rest of the body nearly cylindrical. There is a rather striking oblique fold on the side of each segment in the neighbourhood of the spiracles, and the whole body has a somewhat wrinkled appearance. The head is brown, much speckled and blotched with darker brown; the clypeus and mandibles are dark brown; the second segment with a shining, very pale ochreous dorsal plate, marked with brown, and having a broad darker brown dorsal band extending to the subdorsal lines; the body is verdigris-green, marbled with dingy ochreous, and more or less suffused with pink, sometimes almost crimson, the green often entirely disappearing except between the segments; the eleventh, twelfth, and thirteenth segments more entirely ochreous, the latter having a shining ochreous anal plate, generally slightly dotted with black; a similar plate extends over the whole of the hinder half of the anal clasper down to the foot; the dorsal, subdorsal, and two other lines above, and one just below the spiracles are greyish, and rather darker than the ground colour; the line immediately above the spiracles very distinct and blackish on the second, third, and fourth segments, the dorsal line also

being more distinct than the rest. The spiracles are black, small but distinct; the legs are marked with pale brown, and having a double narrow black mark in front where they join the body; the claspers are pale ochreous, hooklets reddish-brown; the under side of the body is pale ochreous, tinged with pink, and with verdigris-green showing through here and there. The usual warts are polished, but otherwise like the adjacent skin, except for a small dark brown dot in the middle, from which springs a pale ochreous bristle.

The pupa is very dark brown, polished, much paler between the segments; the wing-cases, etc., are very distinct; there are two small hair-like projections from the last segment.

The moths began to emerge on the 6th of May, 1889.

I find that the imago, like its relative, *Ypsipetes elutata*, will fly on nights when scarcely anything else is on the wing; but it is not, so far as I have seen, an abundant species, and is also local. I only take it here in one place, though there is plenty of sallow in the neighbourhood.

I delayed the publication of the above in order to obtain fuller information on one or two points, and have been unable to secure eggs until the present year, 1891. (Nelson M. Richardson, 13th September, 1891; E.M.M., November, 1891, XXVII, 296.)

YPSIPETES IMPLUVIATA.

Plate CXXXVIII, fig. 6.

On the 11th of September, 1867, Mr. George Baker, of Derby, very kindly sent me several larvæ of this species feeding in curled-up leaves of alder. After they came into my care I noticed that they lived and fed continually in concealment, which they managed to do either by uniting leaves together (somewhat

after the manner of the *Cymatophoræ*), or else by curling one side of a leaf over the other.

The usual position in repose is a curve, the head being turned sideways round to the middle of the body; but when a larva is exposed by being ejected from its dwelling, it loops with activity, pausing occasionally, and stretching its head in all directions in a most impatient manner, as if in search of another retreat. It is only when so stretched out that its actual length can be momentarily observed.

When full-grown, it is then seen to be about seven-eighths of an inch in length, and rather thick in proportion, the body very slightly depressed, of about equal bulk throughout, for it tapers but a very little just at each extremity.

In some the ground colour of the back is pale purplish-grey, or brownish-grey, with the belly of the same; the head is brown, freckled with still darker brown; the back of the second segment is black, with the dorsal line running through it as a pale greyish line, but on all the other segments it is wider, black in colour, and thickest about the middle of each segment, suggestive there of an elongated diamond on some of them. The rather thick subdorsal line is of the pale ground colour, begins on the second segment, and is equally well defined throughout its entire length, by reason of the back above being freckled and suffused more or less with dark purplish-brown, especially around the thickest part of the dorsal line, where, on each side of it, an indistinct dark wedge is thus formed with its base on the dorsal line, and its point directed outwards and forwards; besides the general clouding and darkening of the back, there is also a series of black wedge shapes that tend to define the upper edge of the pale subdorsal line much more clearly; these are placed at the beginning and end of each segment, the anterior one pointing backwards, and the posterior one forwards, while on the thoracic segments they become united and linear.

The side, as far as the spiracles, is freckled and clouded with dark purplish-brown, similar to the back, and a fine longitudinal line of the pale ground colour runs through it near the lower part; the spiracles are black, and followed by a broad stripe of the pale ground colour, and then a fine interrupted line of blackish; the tubercular dots are black, each emitting a hair, and the prolegs tipped with blackish.

In other examples the ground colour is pale pinkish, ochreous, or flesh-colour, and the markings are brown and much paler; the black wedge shapes almost, or even entirely, absent, and the dorsal line is interrupted at the beginning of the segments.

By the middle of October these larvæ had ceased feeding, and did not retire to earth, but remained motionless within their hiding-places in the leaves, and so continued until the beginning of December, when they became pupæ therein.

The pupa is nearly half an inch long, rounded at the head, thick in the middle, the abdomen tapering to a point with anal spikes attached to the threads spun within the leaf; its colour is bluish-black, and it is entirely without gloss.

The perfect insects appeared from the 22nd to the 24th of May, 1868. (William Buckler, January, 1870; E.M.M., July, 1870, VII, 42.)

COREMIA PROPUGNATA.

Plate CXL, fig. 7.

I received a batch of eggs of this species through the kindness of Mr. Owen Wilson, of Carmarthen, on the 16th of June, 1876.

The eggs were globular, smooth, and polished, and uniformly pale straw-colour; two days later, or three or four after they were deposited, they had become orange, and before hatching changed to lead colour.

The young larvæ appeared on the 23rd of June, were slender, dark olive-brown, the head brownish.

They fed up rapidly on young cabbage leaves, and by the middle of July were full-grown.

Length of full-grown larva about an inch, and of moderate bulk in proportion; the head has the lobes rounded, and is considerably narrower than the second segment; body rounded above and below, but the two portions are distinctly divided by the skin at the sides forming a raised lateral ridge; it is of tolerably uniform width, tapering only a little towards the head; the segments are distinctly divided, and the skin has a somewhat tough appearance.

Ground colour dingy ochreous, but (except on the last four or five segments) is almost entirely covered with dark, dull smoke-colour; in some specimens this dark shade is nearly black, whilst in others a very dark green tint is observable; head glossy, pale brown, with darker brown spots; dorsal line darker green, paler on the posterior segments; subdorsal lines rather waved, grey; there is also an indistinct finer grey line between the subdorsal and spiracular regions, but there are no perceptible spiracular lines. On the anterior of each segment and situated on the dorsal line is a conspicuous rather large black spot, and this spot is generally preceded by an equally conspicuous paler mark, of various tints in different specimens, in some being pink, in others grey or yellowish; spiracles distinct, black, the raised tubercles grey.

Ventral surface dull ochreous or (in some specimens) pinkish; it has a fine smoke-coloured central line enclosed in a band of the ground colour, outside of which, on each side, is an olive band, bordered outwardly with a fine smoky line, and there are faint indications of one or two other waved lines between this and the spiracular ridges; on each side, too, is a double series of black dots of two sizes, a large one being in front, followed by a smaller one.

The pupa is enclosed in a silken cocoon, and is about two-fifths of an inch in length, rather dumpy, smooth, and highly polished; thorax cylindrical; wing-, eye-, and antenna-cases boldly defined; the abdomen attenuated, but not rapidly, towards the anal point, which, however, is fine and sharp. Colour dark brown, the antenna-cases and outer edges of the wings pale brown; the whole changing to deep mahogany-brown just before the emergence of the imago.

All the brood, forming a very fine series, emerged about the middle of August. (George T. Porritt, 4th January, 1877; E.M.M., February, 1877, XIII, 213.)

Coremia quadrifasciaria.

Plate CXL, fig. 10.

The caterpillar of *Coremia quadrifasciaria* is clearly divided into two colours by a line running from the head to the extremity of the last pair of claspers; the spiracles lie in this line of division. The dorsal space is brown, variegated in shade from a light smoky brown to almost black by interrupted lines running throughout its length, interspersed with numerous light-coloured blotches; four rows of minute warts run down this space, from each of which a short bristle is emitted. The head is slightly smaller than the second segment, and of two shades of brown. The spiracles are black. The ventral space is of a very light brown, having a tinge of pink, and variegated, like the back, with blotches of a much lighter shade. The caterpillar thickens towards the middle, tapering gradually to each extremity.

It assumes the form of an Ionic volute when annoyed.

These larvæ were hatched on the 28th July from eggs deposited by a female captured a day or two previously.

They have fed at various intervals throughout the winter on *Galium mollugo*, and they moulted for the last time about the middle of March. (P. H. Jennings, 13th April, 1875; Entom., May, 1875, VIII, 109.)

CAMPTOGRAMMA BILINEATA.

Plate CXLI, fig. 1.

Received from the Rev. H. Williams, of Croxton, 25th March, 1871, feeding on chickweed and grass.

Ground colour pale green, dorsal line dark green between two stripes faintly paler than the ground colour; subdorsal stripe of pale whitish flesh-colour; tubercular dots same colour; spiracular region puffed, and an interrupted stripe of pale flesh-colour close below the spiracles, chiefly visible at the beginning of each segment and down the front of the anal legs; a double central stripe of pale flesh-colour down the belly, and a very thin line of the same colour on either side at a little distance, followed at an interval by a similar line at the beginning of each segment only, interrupted from thence.

This geometer is about an inch long, of moderate substance and uniform bulk, but rather slender, slightly tapering at the very extremities only.

By the 12th of April it became yellower green and fading generally. Very fine soft hairs in the usual situations.

N.B.—The figure, taken too late, shows yellow-green. (William Buckler, 12th April, 1871; Note Book I, 68.)

Another specimen from Rev. H. Williams, which emerged on the 25th of June, 1871. The drawing of the larva is exact in size.

The ground colour as far as the spiracles of a drab colour; the dorsal line much deeper in tint, thickened towards the segmental folds; the subdorsal paler drab stripe finely outlined with darker; between this

and the spiracles is another undulating stripe less pale and faintly outlined with darker; spiracles drab colour, hardly visible. Belly of an ochreous flesh-colour, with a central paler broad stripe and a narrower one on each side, but at some distance. Tiny warty tubercles, each with a fine short bristle. *It is rather rugose.* Feeds on grass. Tucks its head under the frontal segments on the least alarm. Another larva just like it, but rather yellowish-green. (William Buckler, 25th June, 1871; Note Book I, 70.)

Camptogramma fluviata.

Plate CXLI, fig. 2.

In the autumn of 1858, in the Entomologist's Weekly Intelligencer, vol. iv, page 188, I published my first observations on this species, having then lately reared it from the egg, and proved that the difference between the light and dark forms of the imago was merely sexual. Since then I have reared many more broods from the egg, and have largely supplemented my early record of the various stages, until it seemed that the additional information thus collected might justify another and longer note.

A more easy species to rear in confinement I do not know; it seems quite tame and domestic; only let the temperature be warm enough, the larva feeds quietly and rapidly on food that grows everywhere; it spins up contentedly; ninety-nine pupæ out of every hundred produce perfect imagos, and these last again make no difficulty about pairing and continuing their race. In fact, cold alone, and no mysterious instinct as to certain seasons in the year, puts a limit to the number of broods in any given number of months. Indoors, if the food can be supplied, perhaps six or seven broods might be reared in a year; in 1862 I had a female captured on the 22nd

of May, and 152 days after, on the 21st of October, without forcing, I bred its great-grandchildren, and then did not care to carry the strain further. Out-doors, of course, the character of the season would influence the number of broods, but in favourable times, with an early summer and mild winter, I feel sure there might be five broods; and in this I am supported by the published notices of captures made from May to January, both months inclusive; Mr. H. Rogers records the capture of a female at sugar on the 1st of January, 1858 (Entomologist's Weekly Intelligencer, vol. vii, p. 52). In colder seasons there might be no more than three, or even two broods, every stage being greatly delayed by absence of warmth. Thus I have one brood recorded which went through the whole cycle of transformations in twenty-nine days during a hot August, and another in a colder time which took sixty-two days; whilst the brood which hybernates in the pupa state must, of course, take to its share a much longer period, from October or November till next May or June.

The larva, when at large, is no doubt polyphagous, and I know it has been found or reared on *Senecio vulgaris*, *Polygonum persicaria*, and *Agrimonia eupatoria*. Like other geometers that feed on low plants, it is quiet and sluggish in its movements.

In this neighbourhood (Exeter), with the exception of one specimen beaten out of a hedge near a salt marsh and a few others taken at ivy flowers, the great majority of our captures of the imago have been made at the street gas-lamps.

The egg presents no striking peculiarity; it is bluntly oval in outline, flattened; the shell glistening, and faintly covered with very shallow and irregular reticulations; in colour very pale yellow, or greenish-yellow, turning smoky just before the exit of the larva.

The larva is subject to a great range of variation in colour, but there is one variety which certainly out-

numbers the rest, and may fairly be taken for the type; the description of the figure suits all varieties.

The length, when full-grown, is about three-quarters of an inch, the figure proportionately stout for an ordinary geometer, tapering towards the head, cylindrical behind, and slightly flattened forward; head smaller than the second segment, with its lobes well defined.

The ground colour is greenish-grey, the head striped with the commencement of the dorsal and subdorsal lines; the dorsal line dusky and slender, dividing the lobes of the head, and running thence continuously to the commencement of the fifth segment; the subdorsal stripe begins also on the head, and is rather paler than the ground, but edged on either side with a fine dusky line; on the folds between segments 5—10 are five diamond-shaped marks, whitish, but bordered with dusky or blackish outlines, and with the dorsal line appearing in the centre of each as an elongated black spot; the centre of the back, after the middle of the tenth segment, becomes much paler, with faint blackish Λs instead of diamonds, and the subdorsal lines grow indistinct; just above the spiracles is a dark line, continuous on segments 2—5 and 10—13, but showing only as five black dashes at the intermediate folds; the spiracles are small and obscure, but ringed with black, and placed on ground slightly paler than the rest of the body; the tubercular dots are whitish-grey; the segmental folds show slightly reddish; the belly is pinkish-grey, paler down the middle, and with a central and two subspiracular fine dusky lines; the ventral legs have a dark streak, and the anal legs a light streak down them.

Some varieties have the markings as above, but the ground colour all over pinkish-grey; others have a grey ground, without any green or pink tinting in it.

There is a very decided variety of a light yellowish-green colour, without much noticeable marking,

though it is generally possible to trace the dorsal and subdorsal lines faintly, whilst the row of dark dashes above the spiracles show firm and distinct, being apparently the last to change and disappear of all the markings.

In some broods occur varieties having the greenish-grey ground colour, and the usual markings on the front and hind segments, but with the first half of the back of each diamond-bearing segment coloured soft dull pink, so that from above the larva looks to be banded with green and pink; the diamonds pinkish-white; the belly greenish.

There is another variety with a purplish bloom laid over a dull green.

Another has the greenish-grey ground, but with all the markings, diamonds, and lines scarcely showing except just at the folds, where the dusky lines that form them turn red.

Another has the ground on the back of a dull pinkish-brown, all the lines showing light red at the folds.

Another again has the ground pale brown, the diamonds bordered by darker brown tinged with olive, the edgings of the subdorsal stripe distinct and wavy, and bearing some small black dashes on its under side at the end of each segment; the black dashes above the spiracles very distinct; the spiracles themselves black.

As in the greenish varieties sometimes, so also with the brown ones, there are individuals which show a purplish bloom.

In some of the paler greenish and ochreous varieties, the back of the hinder segments bears, instead of As, some pairs of indistinct freckled lines, arranged almost in the form of stunted crosses.

When full-fed, the larva retires into any cover it can find at hand, and either just below the surface of the soil or amongst moss or dried bits of its food, constructs a perfect but thin and weak cocoon of silk,

drawing in enough particles of dust, etc., to give it an oval form.

The pupa is a quarter of an inch in length, with a rather irregular contour; the lobes of the head and the eyes prominent; the wing-cases extending two thirds of its length, the antennæ and leg-cases showing; the abdomen tapering off rather rapidly, and ending in a stumpy spike furnished with two fine spreading hooks; the skin polished, yet finely punctured, the wing-cases more finely punctured still; the colour is a rich brown, with the abdominal divisions light red.

I have bred several hundreds of the moths at various times, but never yet met with an instance of either one of the sexes assuming the colouring of the other. (John Hellins, 14th February, 1871; E.M.M., May, 1871, VII, 279.)

PHIBALAPTERYX LAPIDATA.

Plate CXLI, fig. 4.

In October, 1870, I received, through Mr. Buckler, some eggs of this species which had been obtained by Mr. S. R. Fetherstonhaugh from a moth captured by him in Ireland. Not knowing when to expect the larvæ I kept a portion of the eggs in a pill-box, and put the rest out of doors on some moss. The former soon changed colour, but shrivelled up without producing anything; the latter remained without change till the beginning of May, 1871, when the larvæ appeared in the course of the first week. At first I could not tell what food to give them, but luckily, before I lost all, I thought of trying *Clematis*, and on this I succeeded in getting three of them to feed. Of this trio one died almost immediately, another fed on till the end of June and died, whilst the third about the same time became a pupa. The moth, however, died without emerging, although it was so far deve-

loped that the markings of the wings could be plainly distinguished on removing the pupa-case.

I am able, therefore, to offer some descriptions of the earlier stages, but the question as to the proper food-plant remains to be settled; the moths seem to affect coarse grass and rushes, and *Galium verum*, I understand, grows abundantly where they have been taken by Mr. Fetherstonhaugh.

The egg is of a long oval outline, one end blunter than the other, flattened, and with a depression on the upper surface; the shell covered all over with very faint pentagonal network; colour yellow, changing just at last to olive.

The young larva is smooth, slender, tapering, pale ochreous, with brownish dorsal and subdorsal lines. After it begins to feed the central part of the body becomes greenish, but after a moult or two, and as soon as it really begins to grow, the ground colour becomes pale greenish-grey (much like that of immature *Phibalapteryx tersata*), except on the last segments, which, with the belly, are more ochreous, the dorsal line still brownish, two fine lines on the side, and a stouter one just above the spiracles.

When full-grown the length is rather over seven-eighths of an inch, the figure cylindrical, no longer to be called slender, but moderately stout, and nearly uniform throughout, except the head and second segment, which taper a little, as does also the thirteenth; the skin smooth. The ground colour of the back and sides pale whitish-yellow, the back slightly glaucous, the sides more white; the thin dorsal line formed of greyish freckles; the subdorsal rather higher up than usual, formed also of greyish freckles, darkest near the head, and growing paler towards the thirteenth, and bearing both the dorsal tubercular dots. Below on the side comes a fine greyish line, and just below that again a broader and darker stripe, with still darker freckles. The spiracular region and belly are pale buff; the spiracles and all the usual dots are black.

Through the belly run a central line and three pairs of side lines, all composed of greyish freckles; the head is grey, freckled with a darker tint of the same.

The whole appearance of the full-grown larva much resembles that of a *Eubolia*.

The pupa was placed just under the surface of the fine soil, with no cocoon, but just a few threads; about one-third of an inch in length, cylindrical, and rather blunt at the ends; polished, at first of a delicate, almost golden, brown, afterwards more reddish-brown.

As Mr. Fetherstonhaugh has been fortunate enough to secure eggs again this autumn, and has kindly sent me some more, I hope to be able to verify all these observations, and probably add to them, next season. (John Hellins, 14th November, 1871; E.M.M., December, 1871, VIII, 165; and William Buckler, Note Book I, 112.)

PHIBALAPTERYX LIGNATA.

Plate CXLI, fig. 5.

As long ago as the 5th of September, 1862, I had eggs of this species from Mr. Fenn; but, through ignorance of any suitable food-plant, could do nothing with the larvæ.

Again, on the 8th of July, 1863, I had eggs from Mr. Birks, and managed to keep a larva or two alive for some time on *Galium mollugo* and *Clematis flammula*, but could not bring them to full growth.

During the past season, however, I have been much more successful, thanks to Messrs. Barrett, Birks, and Carrington, to whom I am indebted for supplies of eggs and information concerning the imago.

The natural food-plant is probably *Galium palustre*, which, I am told, grows in the habitat of the moth, for I have found the larvæ thrive well on *G. saxatile*.

although, as shown above, *G. mollugo* did not suit them. But this is a point of taste in which this species is not singular, for I have known some three or four others which would change about from *Galium verum* to *G. saxatile* and vice versâ, but would not go so far as to include *G. mollugo* in their bill of fare.

It appears certain that there are two flights of the moth, the first consisting of larger and finer individuals, and lasting from the end of May to some time in July; and the second of more stunted growth, on the wing some time about the end of August.

The second brood may be only partial, and may depend more or less on the character of the summer. But, whatever be the extent of it, it must be found constantly in different localities. The date given above for eggs—the 5th of September—points to a second brood; and Mr. Carrington, from the experience of former years, made sure of getting eggs a second time last season, and sent me some on the 29th of August.

The dates of the transformations observed by me last year are as follows:—Mr. Birks sent me eggs, which arrived in the shape of young larvæ on the 18th of July. They fed up very rapidly, and began to spin on the 5th of August, and on the 20th I bred several moths. These I could not get to pair, so Mr. Carrington, as mentioned above, forwarded eggs on the 29th of August. The larvæ hatched on the 3rd of September, but, owing to my inability to supply them with fresh food in sufficient quantity (for *Galium saxatile* is *not* plentiful here), dwindled away and died; and I thus lost the opportunity of deciding whether hybernation takes place in the pupal or in the larval stage.

The egg is bluntly oval in outline, flattened, and with a shallow depression on the upper surface, pitted very shallowly all over; in colour pale yellowish, turning leaden at last. The newly hatched larva is noticeably slender, dusky olive in colour, with brownish head.

For a time it remains of a dusky pale green, but

before long dons a more decided dress, dark green above and pale green below.

When about half-grown the ground colour is dull greyish-green, with a dull dark green (almost blackish) fine dorsal line, a fine subdorsal line, and two stouter brownish-green lines just above the spiracles; belly of the ground colour, with central and two side-lines running through it, faint, except at the folds, where they show as strong purplish-brown dashes; at this stage it is altogether duller looking than when full-grown.

When full-grown the length is barely three-quarters of an inch, the figure cylindrical, tapering slightly and gradually from the tenth segment to the head, which is as wide as the second segment; the skin smooth.

The ground colour is a yellowish-green, that on the hinder segments being of a more tender tint than the rest; the back from the fourth to the ninth segments, both inclusive, more or less suffused with dull brownish-pink; the head is green with brownish bristles; the second segment full green, the third dull green, the dorsal line of a deeper tint of whatever colour it passes through, pink through the pink, and greenish after the ninth segment, and thickening almost into a narrow diamond as it passes each fold; the subdorsal line is pale, often edged above and below with a fine dark thread, the upper edging having a blackish dash at the beginning of each segment; the rest of the side is divided by a faint pale line into two halves, of which the upper is of the same colour as the back, and the lower decidedly darker, and on its lower edge, at the beginning of each segment, is a black or blackish dash; the spiracles are reddish, and beneath them runs a pale reddish stripe; the belly is of the ground colour.

In some specimens the pink suffusion of the back is confined to the five folds between the segments 4—9, and is softer in tint, and leaves the centre of these segments of a tender green; the lines and

dashes as above, but fainter. In others the pink may be called purplish; all have the ventral prolegs tinged with purplish-brown, and with a dark dash down them. In some, again, a darker green takes the place of the pink dorsal suffusion. But in any case the full-grown larva has a soft delicate look.

Many of my larvæ spun among their food, others just under the soil, making a weak cocoon with a few silken threads. The pupa is short and cylindrical in figure, the eyes prominent, the abdomen short, the tail covered with the cast larva-skin; the skin polished, the back dark brown, the wing-cases, antennæ, and belly of abdomen bronzy-green. (John Hellins, 21st February, 1871; E.M.M., June, 1871, VIII, 18.)

Having had a further supply of the eggs of the second brood of moths, I think I have satisfied myself that the larvæ from them do not feed up before hybernation, at least when kept outdoors, exposed to the weather. (John Hellins, 14th November, 1871; E.M.M., December, 1871, VIII, 166.)

CIDARIA MIATA.

Plate CXLII, fig. 7.

For the larvæ from which the following description is taken I am indebted to the Rev. G. P. Harris, of Richmond, Yorkshire, from whom I received them on the 19th of July, 1871. It seems to be but little known, common as the perfect insect is.

Larva very slender, and about an inch and a quarter in length; the head, which has the face slightly flattened, is of the same width as the second segment; the body is cylindrical, tapering very slightly from the posterior segments to the head; the segmental folds overlap each other, rendering the divisions distinct; on the anal segment are two short pointed projections; the skin has a slightly puckered appearance; the ground colour is pale green, strongly tinged

with yellow, the segmental divisions being of the latter colour; the head is uniformly pale green; a dark green pulsating vessel forms the medio-dorsal line; this is best seen in young specimens, as it appears to become less conspicuous as the larva approaches maturity; there are no perceptible subdorsal lines, and the spiracular lines are very narrow and indistinct, faintly darker than the ground colour; spiracles imperceptible; ventrally, the ground colour is the same as on the dorsal surface, but has a conspicuous central stripe of pinkish-brown; the legs, prolegs, and anal points are also pinkish-brown.

Feeds on sallow.

The pupa is purplish and rather long. It is enclosed in a very frail cocoon, amongst frass, etc., at the bottom of the cage.

The first larva spun on the 24th of July; the moth appeared on the 21st of August. (George T. Porritt, February 3rd, 1872; Entom., March, 1872, VI, 49.)

CIDARIA PICATA.

Plate CXLII, fig. 8.

The eggs were laid in confinement, singly, on the leaves and stems of *Alsine media* (common chickweed) the last week in July, 1874.

The young caterpillars were hatched on the 9th of August, and moulted three times, about the 16th, 23rd, and 30th of the same month.

When at rest they lie extended on the stem of the food-plant, and when disturbed they assume the form of an Ionic volute.

The body of the larva is nearly uniformly cylindrical throughout its length, slightly increasing towards the extremities. The head and face are of a light yellowish-brown, marked with spots and short lines of a deeper shade. The colour of the back between the spiracles varies in different individuals

from pale olive-green to reddish-brown. The whole of this space is of two shades, the lighter represented by very irregular lines, at one time confluent and then separate, with very irregular edges. There is a black patch in the middle of the seventh, eighth, and ninth segments; this becomes less distinct as the caterpillar increases in size, and in some cases altogether disappears. The sides below the spiracles and the ventral space are of a lighter shade than the back, the line of demarcation being well defined. The whole of this portion bears a considerable resemblance to the back, as far as the markings are concerned, being made up of very irregular lines of alternate darker and lighter shades. The legs and claspers are of the lighter shade. At the sides of the junctures of the segments there are spots of a much darker colour. The spiracles are black.

The caterpillars disappeared about the end of the first week in September, making a slight cocoon on the surface of the earth, and changing to a chrysalis of a light reddish-brown.

In confinement it is double-brooded. During the second week of September, 1874, I had a few imagos emerge from the pupæ of a brood which fed up about the middle of August. (P. H. Jennings, September, 1874; Entom., October, 1874, VII, 230.)

CIDARIA SAGITTATA.

Plate CXLIII, fig. 1.

The larva of *Cidaria sagittata* is rather short and stout, generally being in a hump-backed posture, but not curling in the front segments. The head is small, and sunk in the second segment; the skin on the front and hind segments is wrinkled, whilst across each of the segments from the fifth to the tenth (both included) there runs a transverse elevated ridge, which on each side of the spiracular line meets a longitudinal

ridge, and forms with it a lateral hump. The ground colour is a pale sulphur-green, along the region of the spiracles running into a rich pink, edged below with black, which blends into a broad lateral stripe of dark olive; the belly is of the pale ground colour; on the front segments are four dorsal stripes of a full green; the transverse dorsal ridges are of a velvety olive-green, softening anteriorly into the pale ground colour with a tinge of pink, and becoming black at the sides. The hind segments are blackish-green on the back, and much suffused with pink. The spiracles are pink, six of them being enclosed in the black of the transverse ridges.

The pupa, which is enclosed in a slight earthen cocoon, is remarkably short and stout, and much tinged with green.

From what is here said of the larva of *C. sagittata* it will of course be seen that it does not at all follow the typical form of *Cidaria* larvæ, which is, as Stainton's Manual has it, "elongate, slender;" in fact, it is more like the larva of *Pelurga comitata*, though far excelling it in singularity of form and beauty of colour; it is, indeed, a very striking and handsome creature, and the exquisite contrasts of its tints have inspired my friend Mr. Buckler even to excel himself in the magnificent figure he has taken of it.

The discoverer of the larva is Mr. Alfred Fryer, of Chatteris, Cambridgeshire, who found it in some abundance in his garden last year, and gave a portion of his captures to Mr. W. Farren; the latter at once guessed the species of the then unknown, but we did not like to say anything about it till the moths appeared; and luckily this summer, about the middle of July, Mr. Farren bred one moth, and satisfactorily proved the correctness of his guess as to its species. The rest of the pupæ from the larvæ taken by Mr. Fryer in 1862 are partly, I fear, dead—partly, I hope, remaining over till 1864. However, this year (1863) he has again found it in his garden, and most kindly sent

Mr. Buckler and myself a good supply, from individuals of which figures and descriptions have been taken.

Mr. Fryer tells me that the moths are plentiful in his garden during the first half of the month of July, and he finds that they lay their eggs (of a pellucid violet tint, changing to orange afterwards) in little bunches of four or five together, on the seed-vessels of *Thalictrum aquilegifolium*, and more rarely of *T. flavum;* the larvæ, orange-coloured when they first appear, are hatched about the beginning of August, and have a habit of biting half through the stalks of their food-plant, and feeding on the leaves, which they have thus caused to become partly withered. They feed through the month of August, some of them being found far into September; and, although they are not strictly gregarious, may be found on one plant to the number of a dozen or more, their presence being easily detected from their habit of feeding mentioned above. I believe it is not yet known what *wild* plant they feed on in their haunts in the fens, but I found that they would eat the old dry-looking leaves of *Aquilegia vulgaris* or columbine, though they would not touch the young and slender ones. (John Hellins; Entom. Annual, 1864, p. 137.)

Cidaria russata.

Plate CXLIII, fig. 2.

[We give under the next species, *C. immanata*, Mr. Hellins' comparative notes on the earlier stages of it and the present one.]

Cidaria immanata.

Plate CXLIII, fig. 3.

I send the following note, in the hope that some account of the investigation of the earlier stages of these species, on which during the past twelve

months I have bestowed as much pains as untoward circumstances would permit, may not prove altogether unacceptable.

To begin with *C. russata*. On the 11th of August, 1863, I captured a female moth; she at once laid some eggs, from which the larvæ were hatched simultaneously on the 23rd of the same month. I fed them on sallow and strawberry, and they attained the length of half an inch before hybernation. About the 15th of February, 1864, they began to feed again, and had all of them attained their full growth and were spun up between the 10th and the 23rd of April. During the latter month I also captured four or five larvæ, and they too were spun up by the 26th. The moths (about fifteen in all), from both bred and captured larvæ, emerged between the 5th and the 18th of May. Meanwhile, on the 10th of May, I received from Mr. Batty, of Sheffield, one full-fed larva, which he had found on whortleberry; this spun up at once, and the moth appeared on the 27th of May. A few days later, during the first week of June, I obtained four or five batches of eggs from captured females. The larvæ from the first of these were hatched on the 11th of June, and the rest in due order; they fed up fast on sallow and strawberry; the first began to spin on the 15th of July. The first moth appeared on the 5th of August, and the rest continued to emerge till the first week in September. I did not set out all of them, but there must have been several dozens.

Now for the dates of *C. immanata*. I captured a female moth of the var. *marmorata* on the 12th of August, 1863; she at once laid eggs. Also in the latter part of August and the first week of September I received from Mr. J. B. Hodgkinson (who was then in Westmorland) and from Mr. Batty, of Sheffield, several batches of eggs laid by females of the dark type (they kindly enclosed the moths for my inspection); some of these eggs I kept for

a time indoors and some outdoors, but not a single larva broke shell until the 5th of March, 1864, when the larvæ of my *marmorata* began to make their appearance, at the rate of one or two a day. The eggs from Westmorland and Sheffield, having been deposited in chip boxes, could not so well be kept damp, and had nearly all dried up; most fortunately, however, in the first week of April a few larvæ were hatched from them. The var. *marmorata* larvæ fed away freely on wild strawberry, and occasionally on sallow, and began some of them to spin up on the 27th of May (the day on which I bred my latest specimen of the spring moths of *C. russata*), and by the 11th of June all were in pupæ; the moths, to the number of nearly fifty, emerged between the 13th of June and the 4th of July. The type *immanata* larvæ fed up more slowly, going into pupæ from the 10th of June to about the same day in July, and the moths appearing from the 28th of June to quite the latter end of July, numbering about a dozen in all.

The above dates call for no special remark, except that (as is the case at times when insects are reared in confinement) some of them are a little earlier than those rightly assigned for these species.

I subjoin comparative descriptions of the eggs and larvæ, the latter made from living specimens, and rendered more exact by the help of Mr. Buckler's pen and pencil. It was a great satisfaction that in the second week of July we were able to put full-grown larvæ of the two species side by side for comparison, but I am sorry I was not able to make fuller notes of their changes after each moulting.

The eggs of *C. russata* are of a flat oval shape, in colour a very *pale ochreous*, resembling that of a pale tinted chip box.

The larvæ of *C. russata* when first hatched are *dirty whitish*, and somewhat translucent; after a change of skin they become green-

The eggs of *C. immanata* do not differ from those of *C. russata* in shape, but in colour are yellowish, sometimes lightish red.

The newly hatched larvæ of *C. immanata* are *yellow*, nearly as yellow as the pollen of the flowers of the wild strawberry; this

ish, and some individuals soon acquire a pink spiracular stripe, which, however, occasionally disappears again at the last moult.

When full-fed, fine individuals (the hybernated larvæ were finer than the summer broods, and resulted in finer moths) attain the length of an inch and a third; in shape they are rather long and slender, the head round but flattish above, the anterior segments a good deal wrinkled, the spiracular region puckered and projecting, thus giving the whole larva rather a flattened appearance; the two anal points *acute*. The ground colour varies from a yellowish-green to a light tint of full green; the slender dark green dorsal line is *bordered by the ground colour*; the subdorsal line is pale yellow or yellowish-white; in some individuals there is a broad purplish-red stripe extending from the second to the thirteenth segment, and including the ventral and anal pairs of legs; in others this is of a rose-pink, and is much narrower, and extends from the third to the tenth segment; others again have only a row of five or six irregular dashes of pink, whilst in a great many there is no pink whatever to be seen, but instead a slender stripe of a dark tint of the ground colour running along the spiracles; segmental folds yellow, dots and spiracles whitish, anal points sometimes pink, sometimes green.

seemed to me a very strong mark of distinction from *C. russata*, and was possessed by the larvæ both of the type and the variety (*marmorata*), which, in fact, at every period of growth were identical in colour and markings; after the first moult they become more greenish.

When full grown they attain the length of about an inch and a quarter. In shape they much resemble *C. russata*, only they seem *more cylindrical*, and the anal points are *blunt;* the ground colour is a *dull, pale* yellowish or whitish-green; the dark green dorsal line is bordered by a space *paler than the ground colour;* the subdorsal line is dirty whitish, and at the middle segmental folds, just above the spiracles, are six or seven *pale oblique streaks;* the spiracular line is green, with a yellowish thread running throughout its length; dots and spiracles white; segmental folds yellow, anal points sometimes very pale pink, sometimes pale green. Altogether the full-grown larva (although when first hatched so gaily dressed) is a much duller looking creature than that of *C. russata*.

The pupæ, with their transparent cases, showing green when new, and growing darker as the moth approaches perfection, as well as the slightly formed cocoons, did not appear to differ. (John Hellins; E.M.M., December, 1864, I, 165.)

Cidaria suffumata.

Plate CXLIII, fig. 4.

Half a batch of eggs arrived from Mr. J. T. Carrington, of York, on the 14th of May, 1872. They were laid singly and in clusters.

The egg is of an oval shape, its surface pitted minutely or covered with a lace net-like surface or minutely honeycombed pattern.

When first laid, on the 2nd to the 5th of May, they were white, as Mr. Carrington informed me, but on the 14th more of an amber-like shining appearance. On the 17th they became green, and on the 18th began to hatch.

The young larvæ were at first of an ochreous green colour, and were supplied with *Galium mollugo* and *G. aparine*, and they at once chose the latter plant. In three days they showed the internal vessels through the skin as a deep pinkish stripe. By the 31st of May they were three-eighths of an inch long, of a similar ground colour, but no longer transparent; they began now to show much of their more adult markings, the back being covered with dark brown markings, with pale dorsal spots at the segmental divisions. (William Buckler, June, 1872; Note Book I, 174).

Cidaria reticulata.

Plate CXLIII, fig. 5.

For some years Mr. J. B. Hodgkinson, of Preston, has endeavoured to find the larva of this rare and local species, until at length, in August, 1876, success attended his efforts, and in 1877 he again found the larva, and was lucky enough during the summer to prove the identity of those found the year before by breeding a specimen of the moth, as recorded by him

in the Entomologist's Monthly Magazine, vol. XIV, p. 67. In both years Mr. Hodgkinson sent me a couple of larvæ and occasional supplies of the food-plant, though, from an unlucky accident during winter, I was unable to produce an imago from the first larvæ, but have now been able to breed a specimen on the 9th of this present month of July, 1878. Mr. Hodgkinson's experience is somewhat different, as he tells me he has bred only ten out of quite a hundred larvæ.

With this species there are more than usual difficulties to contend with in rearing the larvæ at any great distance from the growing food-plant, *Impatiens noli-me-tangere*, a native of woods bordering Windermere; for this plant when gathered is quite unsuitable for transporting far, because if the least exposed to air it rapidly shrivels up, or when confined in a tin just as rapidly turns mouldy. Although the larva will, when pressed by hunger, feed on flowers and tender leaves of the common garden balsam, yet it will not thrive unless it has occasionally some of its natural food-plant, the seed-vessels of which it eats out apparently in preference, though it will also eat the leaves if they are in good condition.

The habit of the larva, like that of many other geometers, is to be perfectly quiescent on the stem of the plant all day, looking rather shorter and stouter than when it wakes up at sunset and feeds, and continues to do so at intervals throughout the night, for then it stretches itself to the full as a very active looper, lively enough.

When half an inch long the young larva is very slender, and often rests on a stem, with its head and next two segments bent backwards and anterior legs extended free. Its colour at this stage is a tender yellowish-green, more or less tinged with faint brownish-pink and with whitish subdorsal lines. After moulting and during further growth its semi-transparent skin indicates very well, day by day, on what

it has nourished itself from one night to another, whether on the flowers or on the leaves of the substituted food of balsam; for at one time the body beyond the thoracic segments would be light bluish-green, at another time pinkish-green, or much suffused with deep pink, and whenever it could return to its natural food would become of a more subdued tint of uniform yellowish-greenish.

When full-fed and about to change it contracts in length a little, and appears stouter, while it loses its lively colouring, grows torpid, holds on to any object, occasionally with the anterior legs only, and elevates the hinder legs a little, quite free. This curious posture I observed with the first two larvæ of 1876, when the leaves of balsam were removed, and only a mixture of peat earth and leafy mould remained in their cage, and by the next morning (24th of September) both had buried themselves. But in the case of the two larvæ I received on the 12th of October, 1877 (one much smaller than the other), I saw in the evening of the 15th that the largest had crept between two leaves of the balsam, and a few reticulated silk threads could just be detected around it, and by the 19th it had evidently made up, as the leaves then withering had become closely twisted together in somewhat of a cylindrical form. At this time the smaller larva, which previously had fed fairly well, appeared to be dead or dying, but on placing it in the sun for a few minutes it revived and seemed lively, but the next morning I saw it had not fed, and was again torpid, and, greatly to my surprise, already showed signs of contraction for pupation as it lay under a small bit of moss, although its previous length had not exceeded five-eighths of an inch, and there on the surface of the earth it became a naked pupa on the 29th, and by the end of November had died and shrivelled up.

The full-grown larva measures seven-eighths of an inch in length, and is of a slender proportion, stoutest at the ninth and tenth segments, from whence it tapers

gradually forward, though most from the third segment to the head, which is very small and narrow, with the mouth extended in front; it tapers also just a little towards the anal extremity; the second segment rather short, the others moderately well defined and tolerably plump, with the usual transverse wrinkles of the genus just visible; the colour of the head is very pale watery-greenish, with a fleshy tinge, the thoracic segments (generally paler than the rest of the body) are of a light warm pinkish yellow-green, and sometimes the three or four hinder segments are similar, while those of the middle of the body are deeper coloured, of rather stronger green inclining a little to slaty or pinkish, or else much the same pinkish yellow-green throughout, the sides often deeply tinged with pink; conspicuous on either side of the back is a whitish or faint yellowish-white opaque subdorsal stripe, the dorsal vessel of brownish-red continuous on the thoracic segments shows obscurely through the skin of the back as though deep below it, in some parts pulsating between whitish threads, but at the segmental divisions is strongly and clearly marked on the skin as a spear-point, or thick elongate spot of dark red, often prolonged on one or two of the hinder segments; the anterior margin of the anal legs is pale primrose-yellow; very fine brown trapezoidal dots are sometimes noticeable on the back; on the belly a central yellowish stripe; the small flesh-coloured spiracles are situated on the fine tracheal whitish thread which shows distinctly through the clear skin; this assimilates well with the internal pale fibres which show through the stem of its food-plant.

The pupa is about seven-sixteenths of an inch in length, of a plump figure, the wing-covers rather prominently developed, their rays distinct, the abdomen convexly tapering to a pointed tip, which is furnished with two small converging spines; the surface has a fine punctate roughness, and the colour is light ochreous-brown, rather shining. (William Buckler,

12th July, 1878; E.M.M., August, 1878, XV, 61; and Note Book III, 132.)

CIDARIA POPULATA.

Plate CXLIV, fig. 3.

As there is such a slight description of the larva of this species in Newman's British Moths, I think a more complete one will not be considered out of place in the pages of the Entomologist. I may say here, that although I have reared a large number of these larvæ, I have never seen any of the "green-tinted" forms mentioned by Mr. Newman. This year I fed up two broods from eggs obtained from moths captured last season, and from them the following notes were taken.

The eggs were deposited about July, 1874, and began to hatch on the 3rd of April of the present year.

The newly emerged larvæ were dark greenish-brown, the sides yellowish-green, and the head dark wainscot-brown.

They fed up well on bilberry, and on the 3rd of June, being full-grown, their description was taken as follows:

Length about an inch and a quarter, and of average bulk in proportion. The head has the lobes rounded, but is rather flat in front, and is slightly broader than the second segment. Body tolerably, but rather unevenly, cylindrical, tapering a little towards the head; there is a slight lateral ridge, which on the third segment takes the form of a distinct swelling. The skin has a tough appearance and is rather rough; there are a few exceedingly minute hairs upon it; the segments slightly overlap each other, rendering the divisions distinct. The ground colour varies in different specimens from a median shade of brown to almost black, the great majority, however, being of

the paler type. In these the head is of the same colour, with two median pale lines and a reddish-brown mark on the side of each lobe. On the dorsal surface is a series of large, pale, almost diamond-shaped whitish marks, each of these marks being more or less mottled with brown spots and streaks; those on the posterior segments are the largest and most conspicuous; those on the others, indeed, vary very much both in size and distinctness, in some being confused and not so noticeable. The pale whitish sub-dorsal lines are distinct only on the second, third, and fourth segments, being a continuation of the two pale lines on the head; the space between these pale lines is filled up by a short black stripe, and on the third segment (the swollen one) is a transverse black collar. Along the spiracular region, on the lateral ridge, are a few dull reddish-brown marks. The ventral surface and claspers are of the same shade as the ground of the dorsal surface, but there is a distinct, narrow, dark brown central line, rather broadly bordered with pale greyish-white. The legs are brown.

The cocoon is very slight, and is formed by drawing together with silken threads a few old leaves.

The pupa is about five-eighths of an inch in length; the eye-, leg-, and wing-cases are prominent; the anal tip pointed. The colour is pinkish-brown, the wing-cases streaked with dark brown; the dorsal line is broad, dark brown; behind the head it divides into a V-like mark; there is also a dark brown ventral stripe from the base of the wing-cases to the anal tip.

The first imago emerged on the 21st of June, 1875. (George T. Porritt, 2nd November, 1875; Entom., January, 1876, IX, 13.)

CIDARIA FULVATA.

Plate CXLIV, fig. 4.

I did not know the larva of this common species until the 16th of June, 1877, when, on the occasion of an excursion of the Yorkshire Naturalists' Union to Sharlston, near Wakefield, I beat one out of rose. Since then I have found it easily enough.

Length about five-sixths of an inch, and of average bulk in proportion; head rather narrower than the second segment; it has the lobes rounded, and when at rest appears to be notched on the crown; the notch, however, is really on the second segment, being formed by an extension of the skin into two prominences above the top of the head, and thus forming the notch. Body of nearly uniform width, rounded above and below, but the two portions divided by a wrinkled lateral ridge; the skin has also a wrinkled appearance, and the segments are very distinctly divided.

Head and the ground colour of the body uniformly bright pale green; dorsal stripe composed of a double grey line; subdorsal lines of the same colour, but more boldly defined; a yellow margin extends along the lateral ridge forming the spiracular line, and the segmental divisions are also yellow. Ventral surface, legs, and prolegs bright pale green, the posterior segments yellower, and all the segmental divisions yellow.

On the 25th of the same month the larva changed to a pupa amongst the leaves of its sprig of rose; this was about three-eighths of an inch long, the colour almost uniformly a dull green. From it an imago emerged on the 13th of the following month, July, 1877. (George T. Porritt, 2nd April, 1880; E.M.M., May, 1880, XVI, 276.)

EUBOLIA MENSURARIA.

Plate CXLV, fig. 2.

In the middle of June, 1872, Mr. Greasley, of Wallasey, sent me a supply of full-grown larvæ of this species, from which I took down notes as follows:

Length about an inch, and rather stout in proportion. Head the same width as the second, but narrower than the third segment; it has the lobes rounded, but the face is square and flat; there is a slight notch on the crown. The body has the sides swollen into a puckered spiracular ridge, which gives it a rather flattened appearance, both from above and below; the middle segments are the widest, and it tapers considerably towards the head anteriorly, and from the tenth segment posteriorly. The segments overlap, making the divisions distinct. Skin tough and puckered. The ground colour is pinkish-grey, tinged with pale slaty-blue; the head is pinkish-grey, freckled with black. The medio-dorsal line is slaty-blue; the subdorsal lines are pale ochreous-yellow, narrowly edged above and below with pale brown; the swollen ridge along the spiracles is pinkish; the spiracles and dorsal dots are black. The ground colour of the ventral surface is pale slaty-grey; there is a pale ochreous medio-ventral stripe, throughout which extends a narrow pinkish line; and between this medio-ventral stripe and the spiracular region is another pale ochreous stripe, edged on each side with black, the outer line being broader and more distinct than the inner; the legs and claspers pinkish-grey.

Feeds on *Vicia*, and probably a number of low plants and grasses.

The imagos appeared from the 9th to the 31st of July, 1872. (George T. Porritt, 3rd March, 1873; Entom., April, 1873, VI, 361.)

EUBOLIA BIPUNCTARIA.

Plate CXLV, fig. 4.

On the 6th of August, 1875, I received eggs of this species from Mr. A. E. Hudd, of Clifton, near Bristol. They were globular, very glossy, with a semi-translucent appearance; pale straw-colour. Before hatching, which event took place on the 20th of the same month, they changed to lead-colour, but still retained their glossy character.

The newly emerged larvæ were slate-colour, the head brown. They fed on the common white Dutch clover until autumn, when they hybernated, feeding again in the following spring. By the 8th of June they were nearly full-grown, when I took the following description:

Length about an inch, and stout in proportion; head rather narrower than the second segment, rounded at the sides, but the face somewhat flat; there is a slight notch on the crown. Body roughly cylindrical, and of nearly uniform width throughout, tapering only a very little towards the anal extremity; segmental divisions well marked, and each segment is also divided by transverse ribs into numerous sections; trapezoidal tubercles raised, each emitting a short hair.

Ground colour of the dorsal area pale yellowish-grey with slight green tinge; head very pale yellowish-brown, dotted and freckled with darker brown. Dorsal stripe conspicuous, dark green; on each side of it is another much narrower, and consequently less distinct line, of the same colour; there is also a rather indistinct double line above the spiracles. Spiracles rust-colour, each followed anteriorly by an intensely black dot; tubercles also black. The ground of the ventral surface is much darker than the dorsal area, being a pinkish-brown shade; extending throughout its entire length is a broad stripe of still darker brown;

and within this stripe is a double central yellow line. On the sixth, seventh, eighth, ninth, tenth, and twelfth segments is a double series of large black marks placed within the broad central stripe, but outside, and on each side the double yellow inner line; prolegs brown on the outside, this colour being very noticeable on the anal claspers.

The pupa is about five-eighths of an inch long, smooth, the thorax and abdominal segments polished, the wing-cases duller. It is uniform and cylindrical, but sharply attenuated towards the anal point. Colour almost uniformly bright brown; the anal point, segmental divisions, and eye-cases darker.

The first imago emerged on the 26th of July. (George T. Porritt, 4th June, 1878; E.M.M., July, 1878, XV, 37.)

EUBOLIA LINEOLATA.

Plate CXLV, fig. 5.

A specimen of this insect which I captured on the Cheshire sand-hills in the early part of April last (1872) deposited a few eggs. They were in little clusters, each batch containing eight or ten eggs; their colour was at first pale yellow, but soon changed to bright ochreous-brown. On the 30th of April they had become slaty-brown, and on the following day the young larvæ emerged, their colour being orange, tinged with green.

They fed readily on *Galium saxatile*, though *G. verum* is probably their natural food, as it grows abundantly on the sand-hills.

On the 8th of June I took down a description as follows:

Length about seven-eighths of an inch, slender, and of nearly uniform width throughout. Head a little broader than the second segment, and slightly notched on the crown; the face rather flat. Body cylindrical

and very slightly attenuated from the eleventh to the anal segment. Skin tough, along the sides and at the segmental divisions rather wrinkled.

The ground colour is pale olive-green, at and on each side the segmental divisions pink; the head is greenish-yellow, spotted with black. The dorsal line is dark green, and there is a still darker and much broader smoky stripe above the spiracles; between this stripe and the dorsal line are two faint waved olive-brown lines. The ventral surface is bright yellowish-green, with paler central stripe; the segmental divisions are sulphur-yellow.

The larvæ went underground and changed to pupa about the middle of June; the latter is about a quarter of an inch in length, smooth and shining; very dark brown, with the abdominal divisions pale brown. (George T. Porritt, 17th October, 1872; E.M.M., January, 1873, IX, 197.)

The following account has been drawn up from observation of many broods, kindly sent me from different localities during a period of several years, and touches on a few points which I do not remember to have seen noticed elsewhere.

The moth is noted as being on the wing in every month from April to August, but I do not know that there are more than two broods in the year; for the first, May would be the month, early examples appearing in April, and late ones in June; and in like manner the second brood would be seen in July and August. In 1868 I had a spring brood of larvæ, all the moths from which appeared as a summer flight in July, except one specimen, which remained over the winter, and did not appear till the 20th of May, 1869.

The egg and larva states of the two broods do not differ much in duration; the larvæ come to hatching from eight days to rather more than a fortnight after the eggs are laid, and feed up in the course of from four to six weeks, the speed of development in each case depending on the character of the season; but,

whereas the spring flight has been eight months in the pupa, having passed the winter in that state, the summer flight of moths comes out after little more than a fortnight's stay in the pupa.

The food on which I have taken the larva at large is *Galium verum*, and I have reared it on *G. saxatile*, but it does not seem to care so much for *G. mollugo*. I have noticed that the moth is fond of resting on the coarse grasses which grow in its sandy habitat near the sea, where I have been accustomed to take it.

The egg is rather a long oval in outline, the broader end being also thicker than the other; it is flattened, but is deposited almost upright on its smaller end, in little clusters; the shell is polished, but not brightly, and is very faintly reticulated all over; the colour is at first pale straw, soon becoming almost orange, and at last pale brownish-ochreous.

The larva, when first hatched, is yellowish-ochreous in colour, with a faint, dusky, suffused stripe down the back, and a subdorsal line of the same, the head deeper yellow, the usual dots small and black; when it begins to feed, the food shows dull green in the middle of the body, the rest remaining still ochreous, but it soon becomes pale greyish-green all over; when rather less than half-grown it is greyish-green above, with a dark green dorsal line, and a brownish stripe above the spiracles, all below being yellowish-green or whitish-green.

When full-grown the length is about seven-eighths of an inch, the figure slender, uniform in bulk when viewed from above, but when viewed sideways tapering towards each extremity; the head is nearly as wide as the second segment, somewhat flattened, but the lobes with rounded outline. The colour is variable above, the back being dull pink, lighter or deeper in tint, warm brown or olive-brown; the dorsal line is dark brown or blackish-green, sometimes bordered with yellowish-pink; the fine subdorsal line is yellowish on the second, third, eleventh, twelfth,

and thirteenth segments, on the rest being of a paler tint of the ground colour; the space between the subdorsal line and the spiracles is filled up with two dark stripes of even width, sometimes separated by a very fine pale thread, the upper stripe being dull purplish-pink, pinkish-brown, or olive-brown, the lower dull blackish-green, or almost dull black; just on the lower edge of this dark stripe come the black spiracles; all the under surface is pale yellow, palest immediately below the spiracles, and with a paler line through the middle of the belly; the head is yellowish freckled with brown, the subdorsal lines showing on it free of freckles; the anal and ventral legs tinged with dull pink or purplish-pink, the anterior legs more yellowish; the usual dots small and black, and bearing fine black bristles. I have notes of one larva in which the yellow lines on the back and sides were so much widened, and the darker lines so narrowed, that the general effect was as if the back were coloured greenish-yellow; another, a brown variety, had the subdorsal line bordered above by a dark brown dash at the beginning of each segment, thus presenting the appearance of a dorsal pattern.

The cocoon is very slight but regular in outline, formed just under the surface of the sandy soil, and attached to a leaf or stem.

The pupa is barely one-third of an inch in length, cylindrical and full, stoutish about the thorax, and with the abdomen tapering off rather rapidly; the eye-cases are prominent; the anal tip ends in a conical spike, furnished with two sharp spines set like the sides of a V; the colour is a rich, dark, glossy brown, the abdominal rings paler, with a reddish tinge. (John Hellins, 10th March and 14th May, 1874; E.M.M., April, 1874, X, 255; and E.M.M., June, 1874, XI, 16.)

CARSIA IMBUTATA.

Plate CXLVI, fig. 1.

For eggs of this species I am indebted to Mr. Edwin Birchall and Mr. George T. Porritt, who sent me a good supply in August, 1871.

These eggs were kept out of doors through the winter, and the larvæ began to hatch towards the end of April, 1872,—that is to say, some of them did so; a great many must have died in the egg, and many more soon after hatching, for in the first week of May I found but two alive. The wintry time in April, succeeding the more open weather of the preceding months, was, I believe, the cause of this mortality, and before long killed also one of the two survivors; and yet it has so often happened of late that I have had to carry on my investigations with a single larva out of a numerous brood, that perhaps I ought not to blame the weather so much as some fault of my own; possibly my bungling may be one link in the chain of causes which work together in the natural selection of the individuals whose looks and doings get chronicled in this Magazine.

My one larva of *C. imbutata* grew slowly, feeding on *Vaccinium vitis-idæa* at first, and afterwards on *V. oxycoccos*, kindly sent me by Mr. Birks, until the 16th of June, when it spun up; the moth appeared on the 10th of July.

The egg is not remarkable; it is of an obtuse oblong shape, flattened, with scarcely any gloss on the shell, which is neither reticulated nor pitted; the colour at first is pale yellow, afterwards deeper yellow, and not changing much again when the larva is near hatching.

The young larva is dull yellowish or greenish, with a pinkish head, and with fine dorsal and broader subdorsal brownish lines; as it grows it becomes of a

tender greenish-yellow, and the lines more reddish, assimilating in tints to the young leaves of the food-plant, with their reddened edges and tips; afterwards, by degrees, the whole back of the larva becomes brownish, leaving the under side still yellowish.

The length of the full-grown larva is not quite five-eighths of an inch, the figure somewhat stoutish, uniform in bulk throughout, but its habit of holding the head a little downwards and folding all the anterior legs close up to it gives a clubbed appearance to the thoracic segments when seen sideways, the back of those segments being arched or humped up; the colour all over the back to near the spiracles is of a rather deep brownish-red, with a very fine dorsal and subdorsal line of blackish-red; along the spiracular region is a broad, brilliant yellow stripe, separated on the thoracic segments from the red above by a black edging, but this only appears faintly at the segmental folds for the rest of its length; this broad yellow stripe is blotched at the folds between segments 6 to 10 with beautifully softened blush-like spots of red, the black spiracles standing in the clear yellow spaces; below this comes a line of blackish-green, very fine on the thoracic segments, undulating in its course, and thickening at the folds, becoming gradually tinged with red, till at the tenth segment it is a red stripe; the belly is pale greenish-yellow with a central paler line, bordered by darker lines; the head is dull pinkish-red on the top, paler than the colour of the back, becoming paler still near the mouth; the ventral legs are pinkish-red; the anal legs are brownish-red like the back, with a yellow line down them; the usual dots are small in size, yellow, ringed with brown.

From the look of the young larvæ I was led to believe that, had I reared more than one example, I should have seen some variety of colouring.

When I found my larva ready to change, I put it

into a large chip box with about half an inch of fine loose soil, and it spun its cocoon under this, attaching it to the bottom of the box. The cocoon is very weak, being formed of particles of soil spun together with not much silk.

The pupa is slender in form, three-eighths of an inch in length, the head-piece distinctly shaped, the antenna-cases ending in a little bifid projecting knob or spike, the skin shining; the colour of the head and wing-case was probably somewhat olive-brown when the insect was within, the abdomen of a more reddish-brown.

The imago I bred was rather small, but most beautifully coloured. (John Hellins, 8th August, 1872; E.M.M., September, 1872, IX, 92.)

LITHOSTEGE NIVEARIA.

Plate CXLVI, fig. 3.

For our knowledge of the early stages of this species we have to thank Mr. T. Brown, of Cambridge, who has found the larvæ feeding on *Sisymbrium sophia*, in the locality where he had been accustomed to take the moth.

The larvæ, however, which I have had this summer, whether bred or captured, throve equally well on *Erysimum cheiranthoides*, seeds of which had been sent me in mistake for those of *S. sophia*.

Mr. Brown sent me eggs on the 18th and 25th of June, and the larvæ appeared soon after, and fed up in about a month, all of them having gone to earth by the 1st of August.

On the 3rd of August Mr. Brown sent me some larvæ which he had just captured in their locality, and some of these continued feeding for nearly a fortnight longer.

The larva, when full-grown, is nearly an inch long,

rather slender, flattened beneath, of uniform bulk throughout; the head full large, and rounded.

The colour is very variable; the larvæ reared on *Erysimum cheiranthoides* were mostly paler than the captured ones sent me by Mr. Brown, and as these did not vary much among themselves, we have taken their colouring and markings to form

Var. 1. Ground colour dull olive-green all over except the spiracular region, which is pale yellow; very fine dorsal line of darker tint of the ground colour; sometimes there is a similar line on either side of it, and sometimes again these appear only as a pair of olive-brown or purplish wedge-shaped dashes just before each segmental fold; subdorsal line greenish-grey with darker edgings; the spiracles black, and just above and behind them, in the yellow spiracular stripe, are suffused blotches of the colour of the dorsal wedges.

Var. 2. Ground colour of a fresher, more yellowish green; dorsal region full green; spiracular region yellowish, and the blotches in it of a darker purplish tint than in var. 1, and more clearly defined.

Var. 3. Ground colour greenish-white; three very fine purplish-brown or blackish lines down the back, of which the *central* one becomes wider and darker just *before* each segmental fold, and the *other* two *across* the fold; sometimes these lines are interrupted, appearing only in the thickened parts; sometimes again they are all united by a transverse band just before the segmental fold; the subdorsal line paler than the ground, but edged below with the dark colour; the spiracular region not differing from the rest of the ground colour, with its wedge-shaped blotches, not only above the spiracles, but also with similar ones below them, in some specimens the spiracular stripe being itself interrupted by these pairs of upper and under blotches becoming partially united; the anal flap and the anal pair of legs dark blackish-green or purplish-brown.

This last variety caught the eye, when upon its food, readily enough, but the other two were hard to distinguish from the seed-pods of the mustard plants. (John Hellins, 16th September, 1867; E.M.M., October, 1867, IV, 115.)

Larvæ of Lithostege nivearia.—My specimens were full-fed and went underground on the 23rd of July; examined on the 28th I found they had buried themselves to the depth of two inches, as far as the vessel in which they were confined would allow, and had become shorter and stouter, the colour having changed and assumed a regularly annulated appearance. On the 1st of August I turned out and examined the earth, being anxious to describe the pupa. I found they had undergone their transformation; each had formed a neat little cell in the earth, but without any admixture, so far as I could perceive, of silk; the head-case of the pupa forms a small and slightly projecting knob; the case of the prothorax, or perhaps tippets, is also knob-like on the back; the wing-cases are of medium length, and the wing-rays are rather strongly marked; the surface is rather deeply and confluently punctured, giving the pupa a dull appearance, which I mention in contradistinction to the glabrous exterior so commonly observable in pupæ; and there is a deep medio-dorsal puncture on the fifth, sixth, seventh, and eighth segments, and each of these deep punctures is surrounded by a glabrous space; the abdomen terminates in two very acute and moderately long divaricating spines. The colour of the wing-cases is dull greenish and semi-transparent, and that of other parts dull pale brown. (Edward Newman; Entom., September, 1871, V, 379.)

CHESIAS SPARTIATA.

Plate CXLVII, fig. 4.

[See under the next species (*C. obliquaria*) for Mr. Buckler's comparative descriptions of the larvæ of the two British species of *Chesias*.]

CHESIAS OBLIQUARIA.

Plate CXLVI, fig. 5.

Comparative Descriptions of the Larvæ of Chesias spartiata *and* C. obliquaria.—It is a great pleasure to me to acknowledge my numerous obligations to Mr. W. H. Harwood, of Colchester, and in this instance especially for all the trouble he has so kindly and repeatedly taken to furnish me with larvæ of our two British species of *Chesias*. For three seasons in succession I have thus taxed his patience, because I did not like to speak before I had made quite sure of the distinctive characters of these larvæ, and had satisfied myself still further by breeding the moths.

From eggs of *C. spartiata* forwarded by me to Mr. Hellins in October, 1868, the larvæ were hatched in February, 1869, earlier probably than is natural to the species on account of their not being exposed to the cold, but the imago was not bred till the 9th of October; the time for finding the larvæ at large appears to be the month of May or thereabouts, and so far as my experience goes, September and October are the months for the moth; there is no sign of an earlier brood.

Of the egg of *C. obliquaria* I cannot speak; but the larvæ were sent me by the Rev. E. N. Bloomfield and Mr. Harwood on the 20th of July, and again on the 6th and 26th of September, 1869; the perfect insects appearing this year (1870), the earlier batch between

the 17th and the 21st of May, and the later between the 16th and the 20th of June; with this species also, therefore, it appears there is one brood in the year, variable in the period of its flight.

I now offer descriptions of the full-grown larvæ, giving first the points in which they are both alike, and afterwards those in which they differ.

Both species, then, have the same food-plant, *Spartium scoparium*, and are alike in form; when full-grown they are about an inch or a trifle more in length, uniformly cylindrical and slender; the last two segments tapering a little to the end of the anal flap; when they are stretched out at full length in repose the head is bent down and the legs drawn up towards it, an attitude which gives rather a swollen look to the anterior extremity; the ventral and anal prolegs are moderately well developed.

C. spartiata is generally of a deep full green on the back, sometimes rather yellower-green on the sides; it has a dorsal line of much darker green between two lines of paler green than the ground colour; the sub-dorsal *broad stripe* is as dark as the dorsal line, and is *edged above and below with a fine thread of much paler green;* the spiracular region is puffed; the spiracles are red, faintly outlined with black; the inflated sub-spiracular stripe is either primrose-yellow or white, melting a little above into the green; the anal flap is often rather a deeper green than the ground colour; the ordinary minute tubercular dots are in the usual position, each bearing a short brown bristle; the ventral surface is green with three pale stripes of whitish-green, the central one being the widest. A yellow variety of this larva often occurs, exhibiting more or less distinctly the details above described; it is generally found feeding on the broom blossoms, to which it assimilates well.

C. obliquaria is either of a full green or inclining to bluish-green in the ground colour; the dorsal line of much darker green is edged with a line of very bluish-

green much paler than the ground colour; the subdorsal *line* is thin, *yellow* or *greenish-white*, very finely edged above sometimes, and *always below* with a line of dark green,—this *pale* subdorsal line is, by aid of a lens, seen to be composed of numerous little transverse bars or streaks, with the slightest interval of the ground colour between them; the rather broad inflated subspiracular stripe is pure white or yellowish-white; between the subdorsal line and the subspiracular stripe there is a very thin and fine tortuous line of very bluish-green, paler than the ground colour; its course defines the boundary of the puffed region above the spiracles, and these last are pale yellow, faintly outlined with black; the head is generally bluish-green; the tubercular dots are black, each bearing a short bristle, but they are very minute; the segmental folds are yellowish; two very short anal points sometimes occur, but generally there is only a slight swelling on each side below the flap, the point of which shuts down between them.

The ventral surface is of the green ground colour, with a central paler ochreous-greenish stripe between two lines that are composed of little transverse streaks, similar to those of the subdorsal line before described. (William Buckler, 17th November, 1870; E.M.M., April, 1871, VII, 260.)

ODEZIA CHÆROPHYLLATA.

Plate CXLVI, fig. 6.

On the 28th and 30th of May last (1867) I had the pleasure to receive six larvæ of *Tanagra chærophyllata* obtained from the flowers of earth-nut (*Bunium flexuosum*) by Mr. Howard Vaughan, who has my sincere thanks for making two excursions in quest of the larvæ to a locality where the perfect insects were known to occur.

It is, therefore, to this gentleman that we are in-

debted not only for a knowledge of the larva, which hitherto has been most inaccurately described, but also for that of its food-plant, which, being one of the *Umbelliferæ*, had doubtless been mistaken for *Chærophyllum;* but experience proved that chervil could not be the proper food, as young larvæ obtained from eggs refused it and starved.

This larva, when full-grown, is nearly three-quarters of an inch in length, cylindrical, stout in proportion, and about equally thick throughout, rather shining, and with distinct lines as follows:

Ground colour of the back green or bluish-green, becoming on the sides gradually paler towards the spiracular region. The dorsal line is darker green, and on the anal segment becoming dark red and thicker, forming a very conspicuous mark. The subdorsal stripe of a darker green than the ground colour, and running between two fine lines of pale whitish-green, which in some individuals are also seen to be very finely edged externally with darker green.

The spiracles are red, and below them the green fades into a whitish stripe, and it is forcibly contrasted beneath by a darker tint of the green of the back, softening gradually into a paler green on the ventral surface, where there are three longitudinal whitish stripes, the middle one being the widest.

The larvæ had all retired to earth by the 8th of June, and the moths began to appear on the 27th, and the whole six were out by the 29th of the month. (William Buckler; E.M.M., September, 1867, IV, 85.)

STERRHA SACRARIA.

Vol. VII, Plate CXXIII, fig. 3.

In the September number of the Entomologist's Monthly Magazine, at p. 92, Mr. R. McLachlan re-

cords the capture of a female of this species near Worthing on the afternoon of the 19th of August. That same day she laid seven eggs, which were forthwith entrusted to me, and I am happy to say I can now give a good account of six of them, one unfortunately having been crushed in the quill during its journey.

The larvæ were hatched on the 29th of August, reached full growth and spun up between the 20th and 30th of September, and the six pupæ at the present date look lively and well.

The shape of the egg is singular—a very long narrow oval, with the under side flattened, and, when seen under an inch lens, it appears to be finely dotted all over, as well as ornamented with rows of hexagonal network; its colour when first laid is a pale greenish-yellow, changing in a day or two to a bright coral-red, and from that to a smoky-grey a few hours before the escape of the larva.

The larva on its first appearance is translucent and whitish, with a broad (that is broad in comparison to the bulk of the tiny creature) purplish-red lateral stripe, as pretty a youngling as I ever made the acquaintance of in my experience of lepidopterous larvæ.

At the end of a week the length was about five-sixteenths of an inch; the white colour changed to a soft grey, the lateral stripe brownish-red, and comparatively narrower than at first.

After another week the length was about nine-sixteenths of an inch, the lateral stripe gone, and the colour either a pale green or greenish-brown on the back, with the belly grey.

About the middle of the third week the last change of skin took place, and the larva began to put on its mature appearance.

When full-grown the length is a full inch. The shape is slender, cylindrical, tapering very gradually towards the head; the skin smooth with a few bristles,

chiefly on the anterior and posterior segments; the head rather flat, and widish.

When at rest the larva is not quite straight, the back being slightly raised; when disturbed it curls up spirally (like an *Acidalia*), forming about a coil and a half.

The colour on the back is either a full green or a blue-green, velvety, with the posterior segments more yellowish-green, the belly a delicate whitish-green, and the segmental folds yellow. The head is pale brownish-red; on either lobe a pale stripe bordered above with brighter red, and below with darker brown; the very fine dorsal line, paler than the ground, is bordered throughout more or less distinctly with lines of either a bright rust or deep red colour, which at each of the folds after the fifth segment expand into a V, with the apex pointing forward, and enclose a three-cornered yellowish-white spot; the dorsal line becomes more distinct and its borders of a stronger red after the eighth segment; the anal flap and ventral legs are tinged with purplish-pink; there are two very fine faint brownish-green subdorsal lines, which, in one or two of the larvæ, were on the anterior segments united in one strong brownish-red line, running back from the dark stripe on the lobe of the head; the region of the spiracles yellowish-green, becoming a more decided yellow stripe in the second, third, and fourth, and the eleventh, twelfth, and thirteenth segments, and running down the anal pair of legs; the spiracles reddish.

From this account it will be seen that this larva varies greatly during its growth, the first and last stages being the most beautiful.

The pupa in shape is long, slender, and cylindrical, and very flexible; the head-case projecting and much smaller than the body, which is tolerably uniform in thickness; the wing-cases distinct, widely separated from each other, and reaching halfway between the head and tail; the antenna-cases reaching one or two

segments further. Colour a pale yellowish-olive, head and wing-cases pale olive-green, finely outlined with black; the segmental folds and dots along the side of the abdomen are dark also; the tip of the anal segment and the short blunt spike horny and brown.

Enclosed in an open fine network of dirty yellow silk, either between the stems of the food-plant or against the sides or cover of the cage.

The food chosen was *Polygonum aviculare*, and the rate of growth plainly shows that it was eaten freely; no doubt there are other plants equally acceptable, and Herr Carl Plötz, in one of his beautiful drawings, had figured this larva on a species of chamomile.

At the end of a fortnight the pupæ began to become more suffused all over with a pale brownish tint, and on the 15th of October I noticed one which had changed to a smoky-black, the edges of the wing-cases showing a rich red stripe, and in the evening the moth emerged; since then two more have made their appearance [October 18th], and by the end of this week I expect the other three will have followed their example.

The fore-wings are variable in tint—always very delicate and pretty; and I notice that the moth likes to rest with its wings roofed together at a very acute angle, after the manner of *Cilix spinula*.* (John Hellins, October 4th and 18th, 1865; E.M.M., November, 1865, II, 134, 135; and Erratum at p. 166.)

I regret to say that I have not succeeded at all satisfactorily in my attempt at rearing *Sterrha sacraria*; and I am the more sorry as I am not able fully to account for the causes of my failure. I took in all six perfect insects in August—two females and four males, and I obtained twenty-six ova. Eight of

* The moths were described in the 'Transactions of the Entomological Society of London,' 3rd series, vol. ii, pp. 454, 455, plate xxiii. R. McLachlan.

these went to the Rev. John Hellins, one of the larvæ disappeared when very young, and the other seventeen progressed very satisfactorily until they were full-fed; up to this time they looked perfectly well and healthy. Two of them spun up and changed to fine healthy-looking pupæ, in which state they now are; about eight more spun up and died in the web, and the others died, without any apparent reason, without spinning.

I rather fear the food (*Polygonum aviculare*) which I gave them on Friday, October 4th, was touched with frost, as we had a very sharp frost on the nights of the 3rd and 4th; but whether that can have been enough to kill them I hardly know. The plants did not then exhibit any symptoms of being frost-bitten, or, indeed, at all differ outwardly from the food we were supplying regularly; but the frost then was undoubtedly sharp, and many plants felt it.

My gardener, who has charge of my larvæ when I am from home, is a very careful hand, and an excellent practical entomologist. (John T. D. Llewelyn, 20th October, 1867; E.M.M., December, 1867, IV, 153.)

I am sorry that I can report no better success than Mr. Llewelyn with this species. The larvæ he so generously sent me fed up well, and *all* began to spin; two died without becoming pupæ, while the rest completed the change; and, had they behaved as satisfactorily as the famous half-dozen in 1865, they would have appeared in the perfect state during the latter half of October, but up to this date not an imago has emerged. I have examined two of my cocoons, and found dead pupæ in them; most likely there is nothing better in the rest, but with a lingering, desperate hope I am keeping them on in a room with a fire, unwilling to destroy the least chance there may yet exist of seeing a moth.

Mr. Llewelyn's brood were hatched two or three days earlier in August than the 1865 brood; but on reference to a daily register of the temperature here

in Exeter I find they did not enjoy such a favourable time for their development. Throughout September and October, 1865, the thermometer stood several degrees higher than in the same months of this year, with the exception of one frosty night in October; and as *S. sacraria* is believed to have its head-quarters in climates much warmer than our own, we may suppose that the greater success of the former brood is thus accounted for. At the same time, if we allow that cold is so fatal to *S. sacraria*, we are met by the question, How then can it establish itself at all in this country? For we can scarcely suppose that the specimens taken year by year are fresh immigrants, or the offspring of immigrants which arrived in time to secure sufficient warm weather for the perfecting of their broods.

However, one point has been fairly settled this year, and that is a more correct description of the larvæ. From notes taken by Mr. Llewelyn and myself it seems that nearly every individual of the whole brood of twenty-five presented some little peculiarity of its own, but that all might be fairly ranged under three main varieties.

Var. 1. I have taken for the type the form which has all the characteristic markings, yet without any exaggeration in the colouring. Ground colour on the back a soft delicate grey, on the belly a greenish-white; dorsal line paler than the ground, very finely but distinctly edged with blackish threads, which become stronger on segments 10 to 12; the subdorsal line also pale with fine edgings, and on segments 1 to 5 having a strong dark streak immediately below it, continued backwards as a dark thread. Sometimes the edgings of the lines are not so dark, but have a reddish tint; sometimes again the dorsal line is not of uniform width, but at the fold from segments 5 to 10 opens into a small white dot, immediately followed by a small black dot, which thus interrupts the line.

Var. 2. On one side of the type comes the variety

described in 1865, the ground colour of which is decidedly green, and the edgings of the lines red; some are blue-green, some full green, some bright green; and the edgings are dark red, bright rust-red, or pinkish. As before, the dorsal line varies in different specimens in being either of uniform width or else widened at the folds and interrupted.

Var. 3. On the other side of the type comes a plainer variety, in which the ground is more or less ochreous, sometimes becoming as warm in tint as a piece of clean fresh-cut cork; the belly sometimes whitish, sometimes paler ochreous than the back; the pale dorsal line still varying as before in width, and although occasionally darkly margined, yet more generally in this variety not so distinctly defined; in one or two specimens the lines were scarcely visible.

I noticed that the pupæ were darker than those of 1865, perhaps because they were sickly. (John Hellins, 7th December, 1867; E.M.M., January, 1868, IV, 179, and Erratum, E.M.M., February, 1868, IV, 200.)

The following list of parasites, bred from the larvæ or pupæ of the species included in the present volume, has been kindly prepared by Mr. G. C. Bignell, F.E.S. —G. T. P.

Host.	Parasite.	By whom bred.
Emmelesia alchemillata	*Triclistus lativentris* Thoms.	W.H.B.Fletcher.
	Apanteles sericeus Nees	J. Hellins.
,, *decoloratu*	*Microgaster tibialis* Nees.....	W. H. Harwood.
.. *unifasciata*	*Platylabus thedenii* Holmg....	G. Elisha.
Eupithecia venosata	*Meteorus luridus* Ruthe	W. J. Cross.
,, *linariata*	*Pimpla nucum* Ratz.....	G. C. Bignell.
	Schizoloma amicta Fab.....	G. C. Bignell.
,, *pulchellata*	*Ichneumon pulchellatus* Bridgm.	G. C. Bignell. J. E. Fletcher.
	Platylabus tricingulatus Grav.	G. C. Bignell. J. E. Robson.
	Apantelcs sericeus Nees	G. C. Bignell.
,, *succenturiata*	*Paniscus virgatus* Fourc,.....	G. C. Bignell.
	Microplitis tuberculifera Wsm.	E. Parfitt.
,, *subfulvata*	*Microplitis tuberculifera* Wsm.	H. D'Orville.
,, *pygmæata*	*Limneria submarginata* Bridgm.	W.H.B.Fletcher.
,, *castigata*	*Anomalon clandestinum* Grav.	G. C. Bignell.
	Paniscus testaceus Grav.	G. C. Bignell.
	Paniscus tarsatus Brischk. ...	G. C. Bignell.
	Limneria rufipes Grav.....	G. C. Bignell.
	**Mesochorus semirufus* Holm.	G. C. Bignell.
	Mesoleptus testaceus Fab.....	G. C. Bignell.
,, *pimpinellata*	*Paniscus tarsatus* Brischk.	G. C. Bignell. T. A. Chapman.
,, *denotata*...	*Sagaritis incisa* Bridgm. ...	W.H.B.Fletcher. Mrs. F. Norgate.
	Microgaster tibialis Nees	J. H. Wood.
,, *nanata* ...	*Campoplex juvenilis*	G. C. Bignell.
,, *subnotata*	*Platylabus pedatorius* Fab.	G. F. Mathew. Mrs. F. Norgate.
	Limneria ruficincta Grav.....	G. C. Bignell.
,, *expallidata*	*Casinaria morionella* Holm...	W.H.B.Fletcher.
	Meteorus caligatus Hal.....	G. C. Bignell. B. A. Bower. W.H.B.Fletcher.
,, *absynthiata*	*Paniscus tarsatus* Brischk. ...	G. C. Bignell.
	Campoplex pugillator L.	G. C. Bignell.
,, *assimilata*	*Apanteles lateralis* Hal.....	H. D'Orville.

* Hyperparasite on *Anomalon clandestinum*.

Host.	Parasite.	By whom bred.
Eupithecia lariciata...	*Agrypon flaveolatum* Grav.	T. A. Chapman. E. A. Hall.
	Paniscus tarsatus Brischk. ...	J. Hellins.
„ *abbreviata*	*Paniscus tarsatus* Brischk. ...	G. C. Bignell.
	Campoplex pugillator L.	G. C. Bignell.
„ *togata*.....	*Nemeritis cremastoloides* Brischk.	Mrs. Hutchinson.
„ *rectangulata*	*Ichneumon albicinctus* Grav...	T. A. Chapman.
	Limneria unicincta Grav.....	G. C. Bignell.
	Apanteles popularis Hal.	G. C. Bignell.
Lobophora lobulata...	*Microgaster calceatus* Hal. ...	G. C. Bignell.
Thera variata	„ „ „	G. C. Bignell.
Ypsipetes ruberaria...	*Ichneumon albicinctus* Grav...	G. C. Bignell.
	Pimpla instigator Fab.....	G. C. Bignell.
	Glypta parvicaudata Bridgm.	W. H. B. Fletcher T. A. Chapman.
Melanippe hastata ...	*Campoplex lapponicus* Holm.	W. H. B. Fletcher.
„ *montanata*	*Platylabus dimidiatus* Grav...	G. C. Bignell.
„ *galiata* ...	*Mesochorus fuscicornis* Brischk.	G. C. Bignell.
	Rhogas circumscriptus Nees...	G. C. Bignell.
	Apanteles nothus Reinh.	G. C. Bignell.
Anticlea rubidata.....	*Lissonota brachycentra* Grav.	G. C Bignell.
	Apanteles nothus Reinh. ...	C. G. Barrett. G. C. Bignell.
„ *badiata*	*Apanteles nothus* Reinh.	G. C. Bignell.
	Meteorus deceptor Wesm.	G. C. Bignell.
Cidaria sagittata.....	*Platylabus transversus* Bridgm.	W. J. Cross.
„ *russata*	*Limneria interrupta* Holm. ...	G. C. Bignell.
„ *immanata* ...	*Zele chlorophthalma* Nees.....	B. A. Bower.
„ *prunata*	*Apanteles immunis* Hal.....	G. C. Bignell.
„ *fulvata*	„ *juniperata* Bou.....	G. C. Bignell.
„ *pyraliata* ...	*Limneria carbonaria* Brischk.	G. C. Bignell.
	Apanteles nothus Reinh.....	G. C. Bignell.
Pelurga comitata.....	*Campoplex auriculatus* Foerst.	B. A. Bower. C. Fenn.
Chesias spartiata.....	*Microplitis tuberculifera* Wsm.	G. F. Mathew.
„ *obliquaria* ...	*Microplitis tuberculifera* Wsm.	W. B. Smith.

INDEX.

PLATE CXXVIII.

Emmelesia affinitata.

1, 1 *a*, larvæ after final moult; in seed-pods of *Lychnis diurna*, 27th July, 19th August, 1878; moths emerged 14th July to 4th August, 1879, and 5th July, 1880.

See pp. 1—3.

Emmelesia alchemillata.

2, 2 *a*, larvæ after final moult; on flowers and seeds of hemp-nettle, *Galeopsis tetrahit*, 11th September, 1862; imago emerged 18th June, 1863.

See pp. 3—4

Emmelesia albulata.

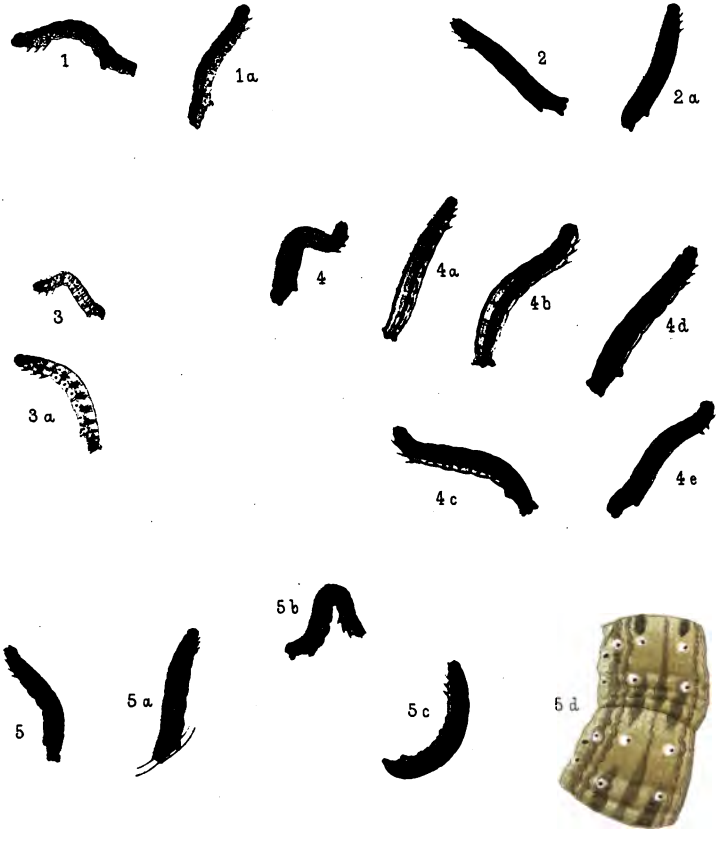
3, 3 *a*, larvæ after final moult; in seeds of yellow-rattle, 26th June, 1865, and 1st August, 1867; imago emerged 9th June, 1866.

See pp. 4—5.

Emmelesia decolorata.

4, 4 *a*, 4 *b*, 4 *c*, 4 *d*, 4 *e*, larvæ after final moult; on seeds and barren heads of *Lychnis*, 4th to 25th July, 1861; imagos emerged 12th May and 8th June, 1862; also in male flower-buds of *Lychnis dioica*, 2nd August, 1864; imagos emerged 9th to 15th June, 1865.

See pp. 5—7.



A.J. Wendel lith.

W. BUCKLER *del.*

P.W.M. Trap imp

PLATE CXXVIII—*continued.*

EMMELESIA UNIFASCIATA.

5, 5 *a*, 5 *b*, 5 *c*, larvæ after final moult; 5 *d*, enlarged details of segments; on seeds of *Bartsia odontites*, 20th October, 1869; imago emerged 3rd August, 1870.

See pp. 9—13.

EMMELESIA BLANDIATA.

6, 6 *a*, 6 *b*, 6 *c*, larvæ in various stages; 6 *d*, 6 *e*, enlarged details of segments; in seed-pods of *Euphrasia officinalis*, 4th to 13th September, 1880; imago emerged 14th August, 1881; also 29th August to 3rd September, 1881.

See pp. 13—18.

PLATE CXXIX.

Eupithecia venosata.

1, 1 *a*, 1 *b*, larvæ after final moult; in seeds of *Silene inflata*, 26th July, 1860, 3rd August, 1864, and 4th July, 1868.

Eupithecia consignata.

2, 2 *a*, 2 *b*, 2 *c*, larvæ after final moult; 2, on apple leaves, 6th July, 1867; moth emerged 5th May, 1868; 2 *a*, 25th June, 1872; 2 *b*, 2 *c*, beaten from hawthorn, 10th July, 1868.

See pp. 18—20.

Eupithecia linariata.

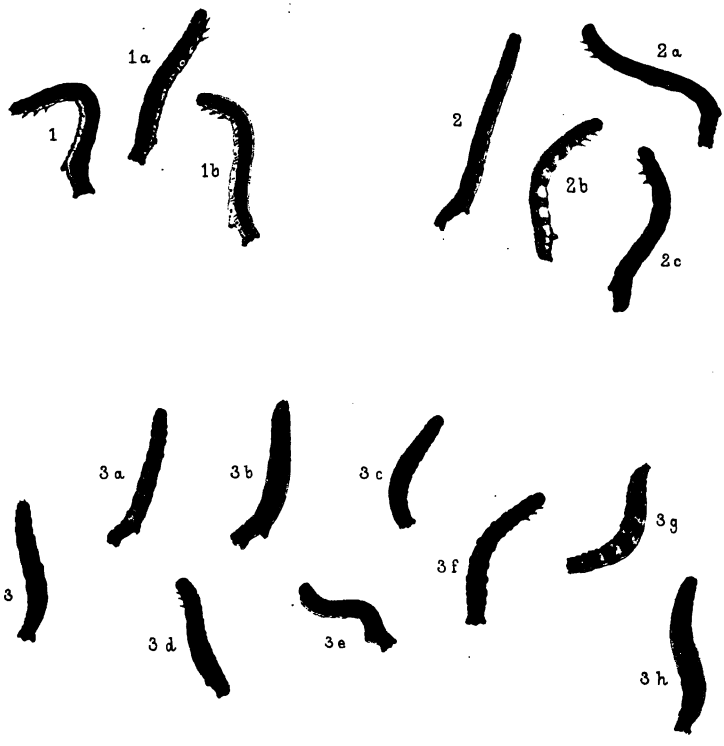
3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, 3 *e*, 3 *f*, 3 *g*, 3 *h*, larvæ in various stages; on flowers of yellow toadflax, 17th September, 1859, 15th August, 1861, and 12th and 13th August, 1864.

Eupithecia pulchellata.

4, 4 *a*, 4 *b*, 4 *c*, 4 *d*, 4 *e*, 4 *f*, larvæ after final moult; on flowers and seeds of foxglove, 9th to 13th July, 1864.

See pp. 20—21.

Plate CXXIX.

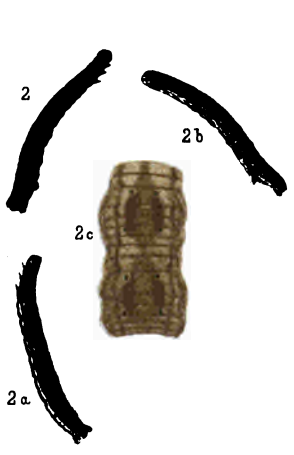


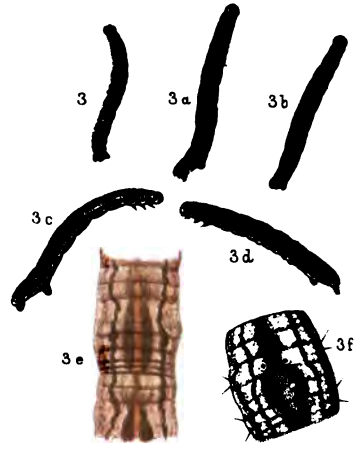
A.J Wendel lith.

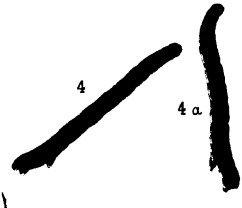
W. BUCKLER *del.*

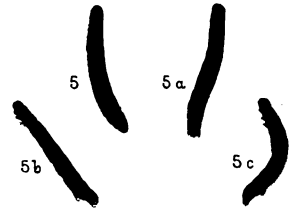
P.W.M.Trap imp.

Plate CXXX.









A.J.Wendel lith.

P.W.M.Trap imp.

W. BUCKLER *del.*

PLATE CXXX.

Eupithecia centaureata.

1, 1 *a*, 1 *b*, 1 *c*, 1 *d*, 1 *e*, 1 *f*, 1 *g*, 1 *h*, 1 *i*, 1 *j*, larvæ in various stages; 1 *k*, enlarged details of segments; on flowers of garden golden-rod, September, 1864; on clematis and mignonette; 1, on *Artemisia campestris*; 1 *d*, on ragwort and flowers of *Pimpinella saxifraga*, 17th September, 1861; 1 *i*, on *Silaus pratensis*, 28th August, 1873, moth emerging 2nd June, 1874.

See p. 22.

Eupithecia succenturiata.

2, 2 *a*, 2 *b*, larvæ after final moult; 2 *c*, enlarged details of segments; on *Artemisia vulgaris*, from Exeter, 11th October, 1860; it fed on the leaflets, eating only the upper green outside; also 17th October, 1874.

See pp. 22—23.

Eupithecia subfulvata.

3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, larvæ in various stages; 3 *e*, 3 *f*, enlarged details of segments; 13th September, 1859; on yarrow, 20th October and 12th November, 1860; on yarrow seeds, 22nd October, 1872, imago emerging 23rd July, 1873; 2nd October, 1874, imago emerging 23rd June, 1875.

PLATE CXXX—*continued.*

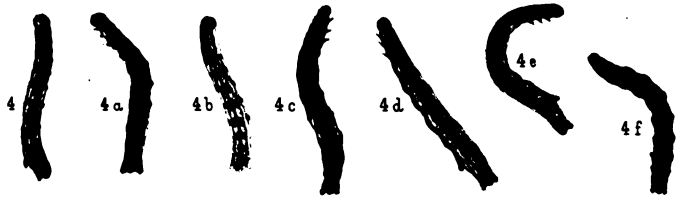
EUPITHECIA SUBUMBRATA.

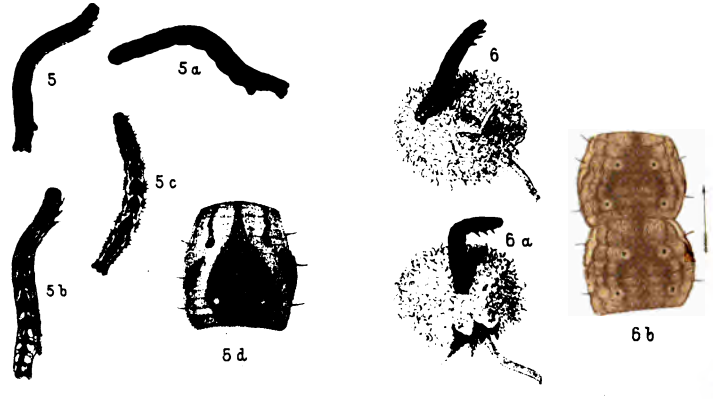
4, 4 *a*, larvæ after final moult; on low-growing flowers, 29th August, 1860.

EUPITHECIA PLUMBEOLATA.

5, 5 *a*, 5 *b*, 5 *c*, larvæ after final moult; on flowers of *Melampyrum pratense*, 15th to 24th July, 1865.

See pp. 23—25.





A.J.Wendel lith. P.W.M.Trap imp.

W. BUCKLER *del.*

PLATE CXXXI.

Eupithecia haworthiata.

1, 1 *a*, 1 *b*, larvæ in various stages; on wild clematis flowers, 16th August, 1860.

Eupithecia pygmæata.

2, 2 *a*, larvæ after final moult; 2 *b*, enlarged details of segments; on flowers of *Stellaria holostea*, 20th to 24th June, 1872, imago emerging 1st June, 1873.

See pp. 25—26.

Eupithecia helveticaria.

3, 3 *a*, 3 *b*, larvæ after final moult; on juniper, 21st September, 1860, and 1862; 4th September, 1871, imago emerging 10th April, 1872.

Eupithecia satyrata.

4, 4 *a*, 4 *b*, 4 *c*, 4 *d*, 4 *e*, 4 *f*, larvæ after final moult; on *Hieracium* and other low-growing flowers, 24th August, 1860; on *Erodium cicutarium*, 20th July, 1867; on sallow and knotgrass, 16th July, 1874, imago emerging 9th May, 1875.

Eupithecia castigata.

5, 5 *a*, 5 *b*, 5 *c*, larvæ after final moult; 5 *d*, enlarged details of segments; on flowers of yarrow, 16th August, 1860; on mugwort, 11th September, 1862; on *Chærophyllum temulentum*, July, 1862; 5 *c* and 5 *d*, on heather, 3rd October, 1873, imago emerging 28th May, 1874.

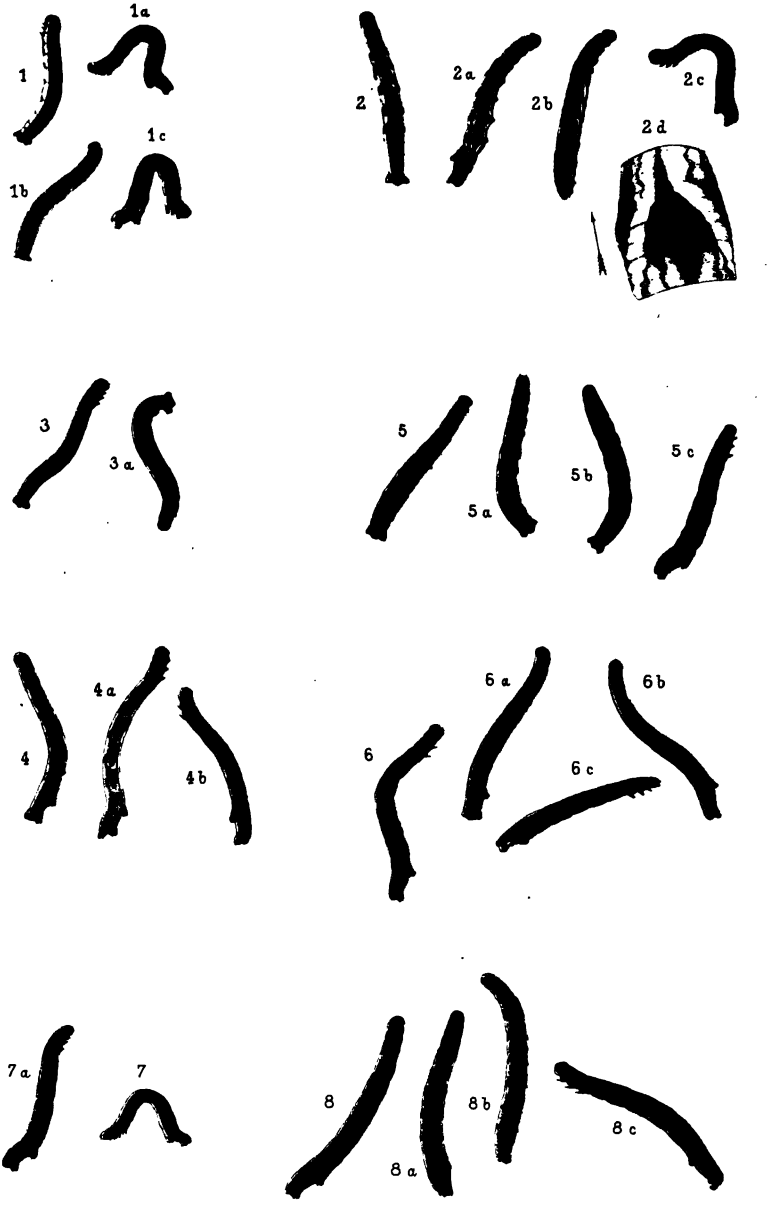
PLATE CXXXI—*continued.*

Eupithecia jasioneata.

6, 6 *a*, larvæ after final moult; 6 *b*, enlarged details of segments; on seed-heads of *Jasione montana*, 22nd, 25th, and 26th September, 1879; imago reared 1st July, 1881, from larvæ taken in 1880.

See pp. 26—29.

Plate CXXXII.



A.J. Wendel lith.

P.W.M. Trap imp.

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PLATE CXXXII.

Eupithecia trisignata.

1, 1 *a*, 1 *b*, 1 *c*, larvæ after final moult; on flowers of *Angelica sylvestris*, 5th September, 1861; and on elder flowers, 30th June, 1870.

Eupithecia virgaureata.

2, 2 *a*, 2 *b*, 2 *c*, larvæ after final moult; 2 *d*, enlarged details of segments; on flowers of *Senecio jacobæa*, 28th September and 18th October, 1860; on flowers of ling, 8th October, 1861; and on flowers of golden-rod, 2nd October, 1873.

Eupithecia pusillata.

3, 3 *a*, larvæ after final moult; on spruce fir, 6th July, 1861.

Eupithecia irriguata.

4, 4 *a*, 4 *b*, larvæ after final moult; on oak, 23rd June, 1870, imago emerging 24th April, 1871; another larva 10th June, 1871, imago emerging 9th April, 1872; and 25th June, 1862.

See pp. 30—32.

Eupithecia campanulata.

5, 5 *a*, 5 *b*, 5 *c*, larvæ after final moult; in flowers and seeds of *Campanula trachelium*, 19th August, 1864; imagos emerged 8th June to 1st July, 1865.

See pp. 43—45.

PLATE CXXXII—*continued.*

Eupithecia denotata (pimpinellata).

6, 6 *a*, 6 *b*, 6 *c*, larvæ after final moult; on *Pimpinella saxifraga*, 22nd September and 25th October, 1860; also 9th October, 1873, imago appearing 17th July, 1874.

See pp. 33—34.

Eupithecia valerianata.

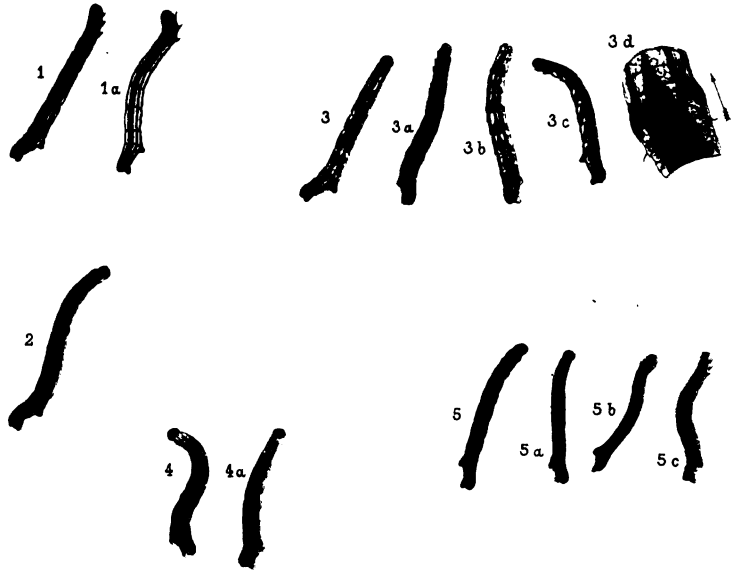
7, 7 *a*, larvæ in various stages of growth; on flowers of *Valeriana officinalis*, 24th July, 1861; imagos appeared 14th and 24th June, 1862.

Eupithecia fraxinata.

8, 8 *a*, 8 *b*, 8 *c*, larvæ after final moult; on ash; 19th September, 1861, 18th August, 1863, 16th July, 1864, 21st July, 1864; imagos appeared 25th to 29th May, 1865.

See pp. 32—33.

Plate CXXXIII.



A.J Wendel lith

W. BUCKLER *del.*

P.W.M.Trap imp.

PLATE CXXXIII.

Eupithecia indigata.

1, 1 *a*, larvæ after final moult; on cypress, 18th July, 1862.

Eupithecia constrictata.

2, larva after final moult; on wild thyme, 6th September, 1860; imago 6th July, 1860 [? 1861].

Eupithecia nanata.

3, 3 *a*, 3 *b*, 3 *c*, larvæ after final moult; 3 *d*, enlarged details of segments; on *Calluna vulgaris*, 15th September, 1860, 12th and 23rd September, 1861, and 6th and 10th October, 1874.

Eupithecia subnotata.

4, 4 *a*, larvæ after final moult; on flowers and seeds of *Atriplex patula*, 4th September, 1861.

Eupithecia vulgata.

5, 5 *a*, 5 *b*, 5 *c*, larvæ in various stages of growth; on flowers of *Chærophyllum temulentum* and on hawthorn, 3rd August, 1860, and 25th September, 1862.

Eupithecia albipunctata.

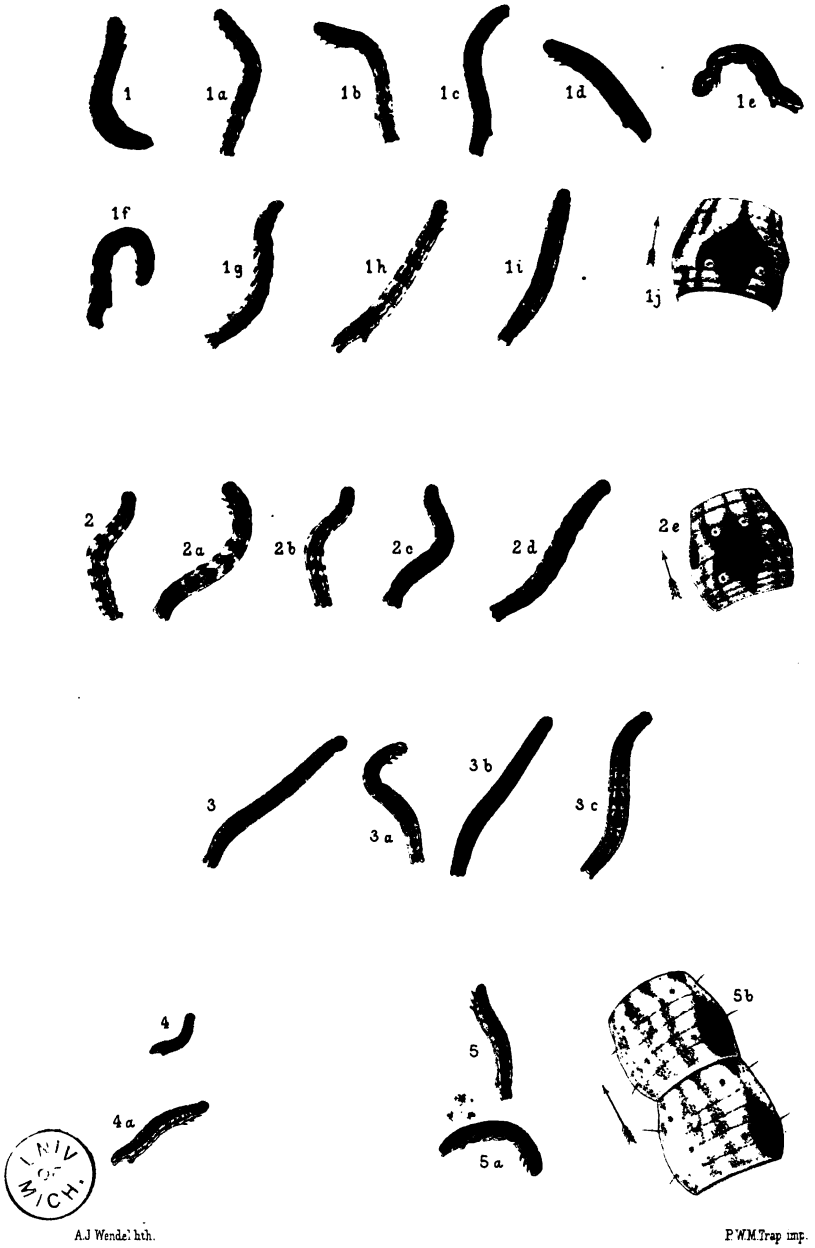
6, 6 *a*, 6 *b*, 6 *c*, 6 *d*, 6 *e*, 6 *f*, larvæ after final moult; on flowers and seeds of *Angelica sylvestris*, 12th September, 1861.

PLATE CXXXIII—*continued.*

Eupithecia expallidata.

7, 7 *a*, 7 *b*, 7 *c*, 7 *d*, 7 *e*, larvæ in various stages; 7 *f*, 7 *g*, enlarged details of segments; on flowers of *Senecio jacobæa*, 10th October, 1860; on golden-rod, 6th September, 1861, and September and 2nd October, 1873; imago emerged 2nd July, 1874.

Plate CXXXIV.



A.J Wendel lith. P.W.M.Trap imp.

W. BUCKLER *del.*

PLATE CXXXIV.

Eupithecia absynthiata.

1, 1 *a*, 1 *b*, 1 *c*, 1 *d*, 1 *e*, 1 *f*, 1 *g*, 1 *h*, 1 *i*, larvæ in various stages of growth; 1 *j*, enlarged details of segments; on flowers of *Senecio jacobæa*, 18th September, 1860; on golden-rod, 12th September, 1863; two on tansy, 7th September, 1869; imago appeared 12th July, 1870; on ragwort, 6th September, 1873; imagos appeared 10th to 20th June, 1874.

Eupithecia minutata.

2, 2 *a*, 2 *b*, 2 *c*, 2 *d*, larvæ after final moult; 2 *e*, enlarged details of segment; on yarrow flowers, 24th August, 1860, and 25th September, 1861; 2nd October, 1874, imago appearing 7th July, 1875.

Eupithecia assimilata.

3, 3 *a*, 3 *b*, 3 *c*, larvæ in various stages of growth; on wild hop, 14th September, 1860; on currant, 5th and 8th October, 1861; and on hop, 11th October, 1878.

Eupithecia tenuiata.

4, 4 *a*, larvæ in various stages of growth; on sallow catkins, 13th April, 1861.

Eupithecia subciliata.

5, 5 *a*, larvæ after final moult; 5 *b*, enlarged details of segments; on maple, 3rd to 17th May, imagos emerging 13th July to 1st August, 1872.

See pp. 45—47.

PLATE CXXXV.

Eupithecia lariciata.

1, 1 *a*, 1 *b*, 1 *c*, 1 *d*, larvæ in various stages; on larch, 16th to 19th July, 1864; imagos emerged 28th April to 4th May, 1865.

See pp. 29—30.

Eupithecia dodoneata.

2, 2 *a*, 2 *b*, larvæ in various stages of growth; on oak, 2nd July, 1861.

Eupithecia abbreviata.

3, 3 *a*, 3 *b*, 3 *c*, larvæ in various stages of growth; on oak, 19th June, 1860, and 17th May, 1862.

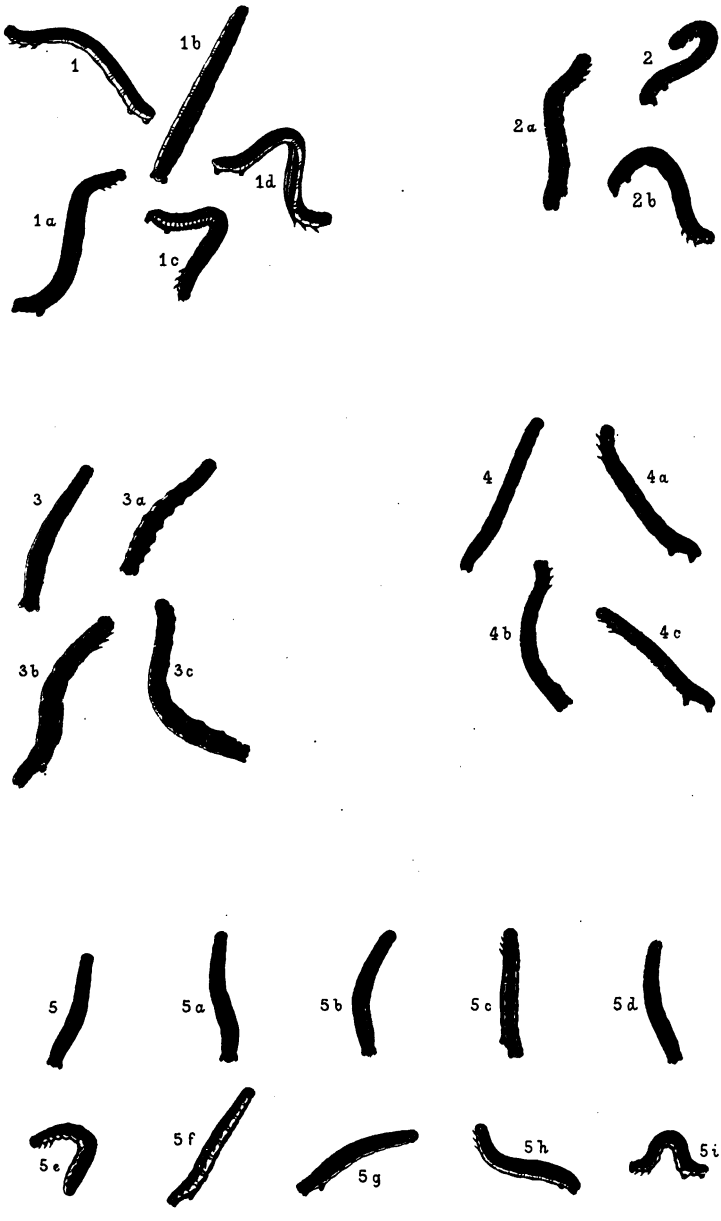
Eupithecia exiguata.

4, 4 *a*, 4 *b*, 4 *c*, larvæ after final moult; on white-thorn, 24th August, 1860; on dogwood, 3rd October, 1860; and 3rd October, 1874.

Eupithecia sobrinata.

5, 5 *a*, 5 *b*, 5 *c*, 5 *d*, 5 *e*, 5 *f*, 5 *g*, 5 *h*, 5 *i*, larvæ in various stages of growth; on juniper, 6th May, 1861.

Plate CXXXV.



A.J. Wendel lith.

P.W.M. Trap imp.

W. BUCKLER *del.*

A.J. Wendel lith.

P.W.M. Trap imp

W. BUCKLER *del.*

PLATE CXXXVI.

Eupithecia togata.

1, 1 *a*, larvæ after final moult; 1, in buds of spruce fir, 21st and 23rd August, 1872; imago emerged 13th June, 1873; 1 *a*, part of a spruce fir cone showing ravages of two larvæ, from Dupplin, 8th September, 1875; ♂ and ♀ moths out 3rd June, 1876.

See pp. 48—52.

Eupithecia pumilata.

2, 2 *a*, 2 *b*, 2 *c*, 2 *d*, 2 *e*, 2 *f*, 2 *g*, larvæ in various stages; 16th September, 1859; one in arbutus flowers, 17th October, 1868; three on holly flowers, 6th and 9th June, 1874; imagos emerged 30th June, 1874.

See pp. 52—53.

Eupithecia coronata.

3, 3 *a*, 3 *b*, 3 *c*, larvæ after final moult; 3 *d*, enlarged details of segment of 3 *c*; on flowers of *Clematis vitalba*, 6th September, 1860; and on *Artemisia vulgaris*, 23rd September, 1862; 3 *c*, 3 *d*, on flowers of *Angelica sylvestris*, 1st September, 1873; moths emerging 7th to 10th April, 1874.

Eupithecia rectangulata.

4, 4 *a*, larvæ after final moult; on apple blossom, 18th May, 1861.

PLATE CXXXVI—*continued.*

EUPITHECIA DEBILIATA.

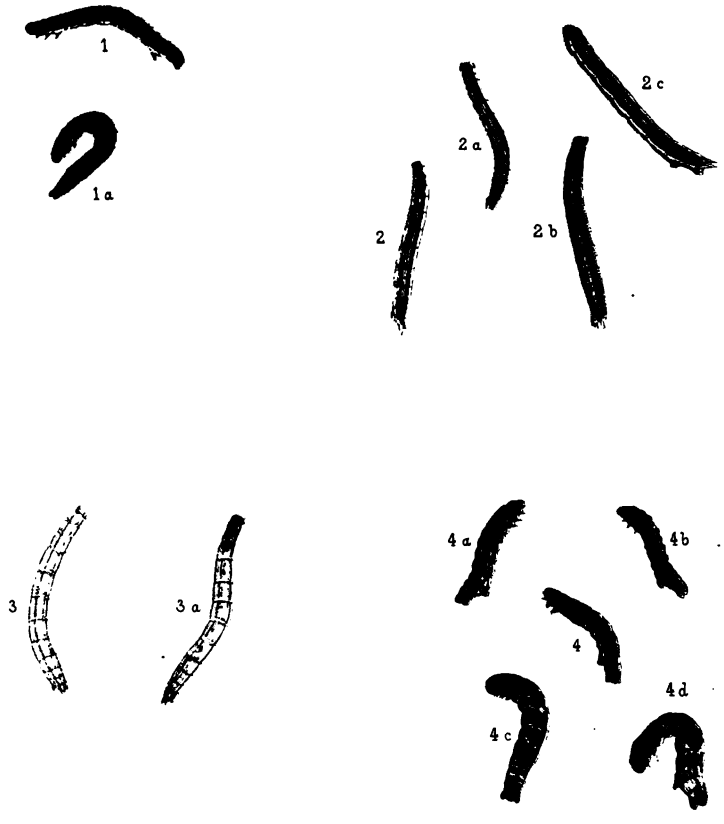
5, 5 *a*, larvæ after final moult; on whortleberry, 13th May, 1863; 11th May, 1864, partially spinning the leaves together and feeding between them; imago emerged 20th June, 1864.

EUPITHECIA INNOTATA.

6, larva after final moult; 6 *a*, enlarged details of segments; on flowers and seeds of *Artemisia vulgaris*, from Rev. John Hellins, 23rd October, 1883; died 22nd November, 1883.

See pp. 35—39.

Plate CXXXVII.



A.J.Wendel lith.

P.W.M.Trap imp.

W. BUCKLER *del.*

PLATE CXXXVII.

COLLIX SPARSATA.

1, 1 *a*, larvæ after final moult; on *Lysimachia vulgaris*, 7th August, 1868, and 25th August, 1876.

See pp. 53—54.

LOBOPHORA SEXALISATA.

2, 2 *a*, 2 *b*, 2 *c*, larvæ after final moult; on sallow, 6th September, 1861, 13th September, 1862, and 27th July, 1864; imagos appeared 20th to 29th May, 1865.

LOBOPHORA HEXAPTERATA.

3, 3 *a*, larvæ after final moult; on poplar, 2nd July, 1862; on aspen, 10th July, 1868; imago emerged 1st June, 1869.

See pp. 54—56.

LOBOPHORA VIRETATA.

4, 4 *a*, 4 *b*, larvæ after final moult; 4 *c*, 4 *d*, a little magnified; on privet, 29th and 30th June, 1865, imago emerging 9th May, 1866; one 13th July, imago out 20th August, 1875; one on ivy blossom buds found 8th, figured 18th September, 1875; moth reared 6th May, 1876; 4 *b* on *Viburnum opulus*, feeding first on the flowers, then on the leaves, 2nd July, 1878.

See pp. 56—60.

PLATE CXXXVII—*continued.*

LOBOPHORA LOBULATA.

5, 5 *a*, larvæ after final moult; on sallow, 6th June, 1860; imago emerged 25th February, 1861; on sallow, 11th June, 1864; imago emerged 9th April, 1865.

LOBOPHORA POLYCOMMATA.

6, 6 *a*, larvæ after final moult; on honeysuckle, 30th May, 1864, imago appearing 20th April, 1865; on ash, 16th June, 1864, imago appearing 18th April, 1865; on privet, 4th June, 1864, imago appearing 28th April, 1865.

A.J.Wendel lith.

P.W.M.Trap imp.

W. BUCKLER *del.*

PLATE CXXXVIII.

THERA JUNIPERATA.

1, 1 *a*, larvæ after final moult; on juniper, 1st June, 1861; several on juniper, 19th and 23rd August, 1872; imagos appeared 27th and 28th September and 2nd October, 1872.

See pp. 60—61.

THERA CONIFERATA (SIMULATA).

2, 2 *a*, larvæ after final moult, from Westmoreland; on juniper, 13th June, 1863; imago appeared 9th July, 1863; on juniper, 2nd July, 1867.

See pp. 61—62.

THERA VARIATA.

3, 3 *a*, larvæ after final moult; 3 *b*, pupa, figured 14th June; on larch, 31st August, 1861; 1st May, 1862; imago appeared 13th July, 1862; on Scotch fir, 12th May, 1866.

See p. 62.

THERA FIRMARIA.

4, 4 *a*, larvæ after final moult; on Scotch fir, 12th May, 1866.

See p. 63.

YPSIPETES RUBERARIA.

5, larva after final moult; on mealy velvety wood sallow, between doubled leaves, 22nd June, 1865.

See pp. 63—66.

PLATE CXXXVIII—*continued.*

Ypsipetes impluviata.

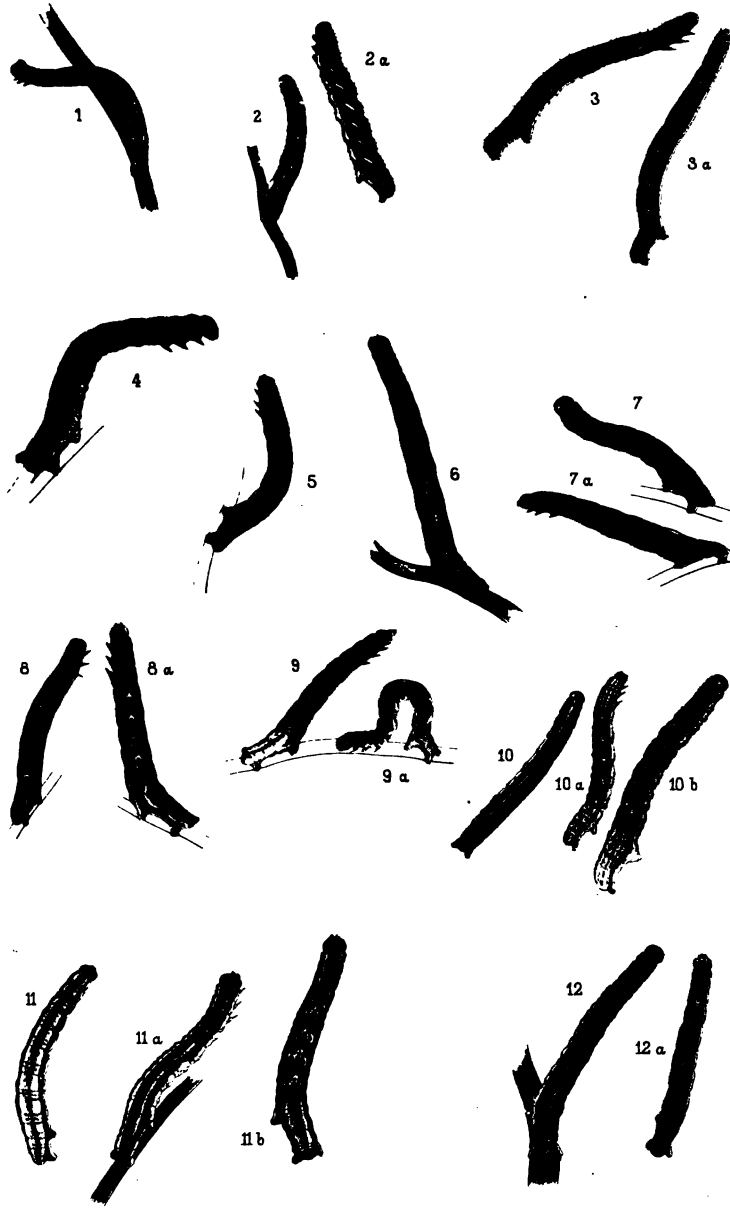
6, 6 *a*, 6 *b*, larvæ in various stages of growth; in curled-up leaves of alder, 11th, 22nd and 23rd September, 1867; imago appeared 22nd May, 1868.

See pp. 66—68.

Ypsipetes elutata.

7, 7 *a*, larvæ after final moult; on sallow, 17th May, 1859, and 16th May, 1862; imago reared 29th June, 1862.

Plate CXXXIX.



A.J. Wendel lith.

P.W.M. Trap imp.

W. BUCKLER *del.*

PLATE CXXXIX.

Melanthia rubiginata.

1, larva after final moult; on alder, 27th May.

Melanthia ocellata.

2, 2 *a*, larvæ in various stages of growth; on *Galium mollugo*, 10th August, 1867.

Melanthia albicillata.

3, 3 *a*, larvæ after final moult; on raspberry, 15th September, 1860; on bramble, 13th July, 1867; imagos reared 18th and 21st May, 1868.

Melanippe hastata.

4, larva after final moult; 27th August, 1859.

Melanippe tristata.

5, larva after final moult; on *Galium mollugo*, 1st August, 1860.

Melanippe procellata.

6, larva after final moult; on clematis, 16th September, 1859.

Melanippe unangulata.

7, 7 *a*, larvæ after final moult; 31st July, 1859.

Melanippe rivata.

8, 8 *a*, larvæ after final moult; on *Galium mollugo*, 22nd July, 1859, and 13th August, 1862.

PLATE CXXXIX—*continued.*

Melanippe subtristata (biriviata).

9, 9 *a*, larvæ after final moult; on *Galium mollugo*, 30th June, 1859; 9 *a*, variety.

Melanippe montanata.

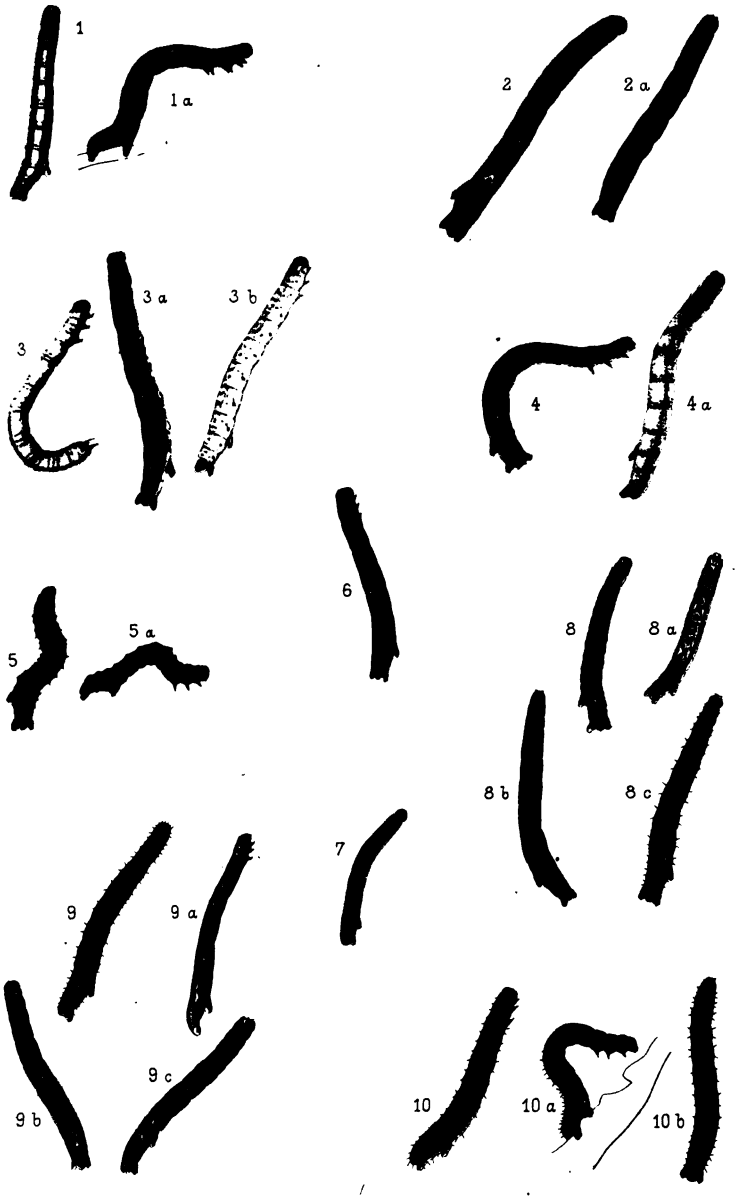
10, 10 *a*, 10 *b*, larvæ in various stages; on primrose leaves, 24th March, 1860, and 12th April, 1864.

Melanippe galiata.

11, 11 *a*, 11 *b*, larvæ after final moult; 3rd September, 1859, and 25th August, 1860; 11 *b*, variety.

Melanippe fluctuata.

12, 12 *a*, larvæ after final moult; 8th September, 1859.



A.J.Wendel lith

P.W.M.Trap imp.

W.BUCKLER *del.*

PLATE CXL.

ANTICLEA SINUATA.

1, 1 *a*, larvæ after final moult; on *Galium verum*, 2nd September, 1861; and on unripe seeds of *Galium mollugo*, 13th September, 1867; imago reared 18th June, 1868.

ANTICLEA RUBIDATA.

2, 2 *a*, larvæ after final moult; on *Galium mollugo*, 8th August, 1860.

ANTICLEA BADIATA.

3, 3 *a*, 3 *b*, larvæ after final moult; on various kinds of rose, 22nd May, 1860, and 5th July, 1862.

ANTICLEA DERIVATA.

4, 4 *a*, larvæ after final moult; on flowers of dog-rose, 27th June, 1862.

ANTICLEA BERBERATA.

5, 5 *a*, larvæ after final moult; on barberry, 9th July and 25th September, 1863.

COREMIA MUNITATA.

6, larva after final moult; on groundsel, 14th February, 1862.

COREMIA PROPUGNATA.

7, larva after final moult; on cabbage, 7th July, 1860.

See pp. 68—70.

PLATE CXL—*continued.*

COREMIA FERRUGARIA.

8, 8 *a*, 8 *b*, 8 *c*, larvæ in various stages; on groundivy; 8th September, 1859, 7th July, 1860, 25th June, 1863, and 4th November, 1864.

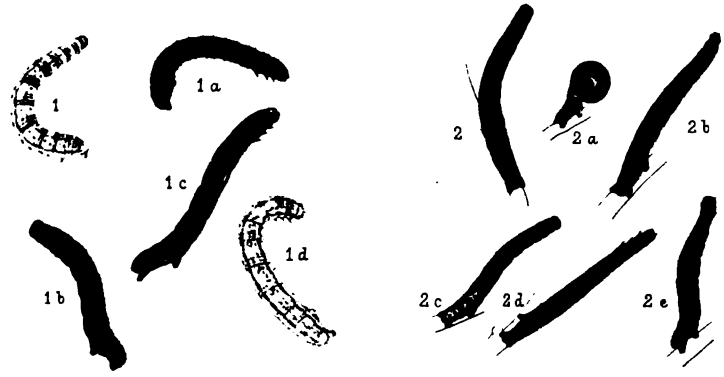
COREMIA UNIDENTARIA.

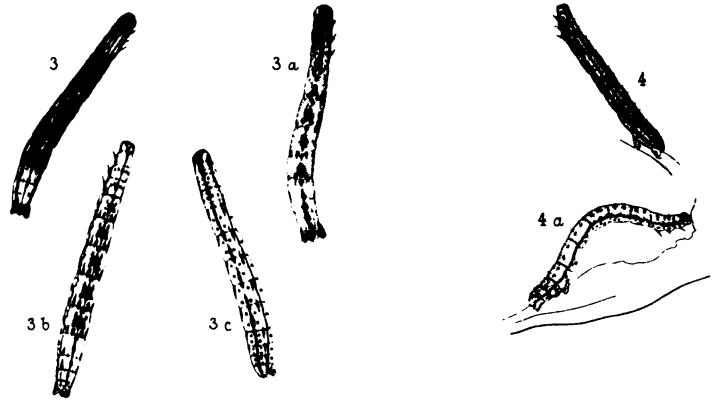
9, 9 *a*, 9 *b*, 9 *c*, larvæ after final moult; on groundivy; double-brooded; 20th October, 1860, 18th July, 1863, and 22nd August, 1865.

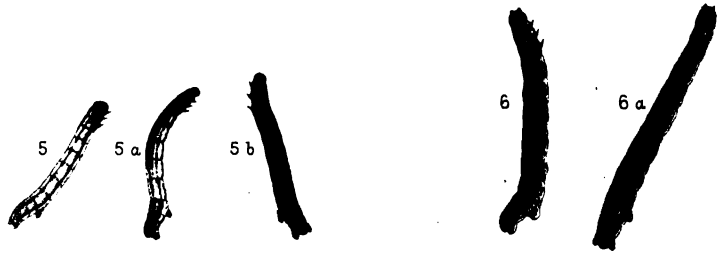
COREMIA QUADRIFASCIARIA.

10, 10 *a*, 10 *b*, larvæ in various stages; on groundsel, 12th April, 1864; imago out, 11th June, 1864; 10 *b*, 6th March, 1868, imago appearing 6th June, 1868.

See pp. 70—71.







A.J Wendel lith.

P.W.M.Trap imp.

W.BUCKLER *del.*

PLATE CXLI.

Camptogramma bilineata.

1, 1 *a*, 1 *b*, 1 *c*, 1 *d*, larvæ after final moult; on chickweed, 13th April, 1861; on grass, 12th April, imago appearing 10th June, 1864; on grass, 17th April, 1863, and 1865; 1 *b*, on grass and chickweed, 22nd April, imago appearing 25th June, 1871; 1 *d*, 30th April, 1866.

See pp. 71—72.

Camptogramma fluviata.

2, 2 *a*, 2 *b*, 2 *c*, 2 *d*, 2 *e*, larvæ in various stages; on groundsel, 24th August, 1860, and 30th September, 1862; the yellow (figure not here reproduced) and brown (2 *d*) varieties, 19th September, 1867; imagos emerged 18th to 23rd October, 1867.

See pp. 72—76.

Phibalapteryx tersata.

3, 3 *a*, 3 *b*, 3 *c*, larvæ after final moult; on clematis, 7th August, 1861; 21st August, 1865, imago appearing 26th June, 1866; 5th August, 1871.

Phibalapteryx lapidata.

4, 4 *a*, larvæ after final moult; reared from eggs laid in Ireland; fed on *Clematis vitalba*, 21st June, 1871.

See pp. 76—78.

PLATE CXLI—*continued.*

PHIBALAPTERYX LIGNATA.

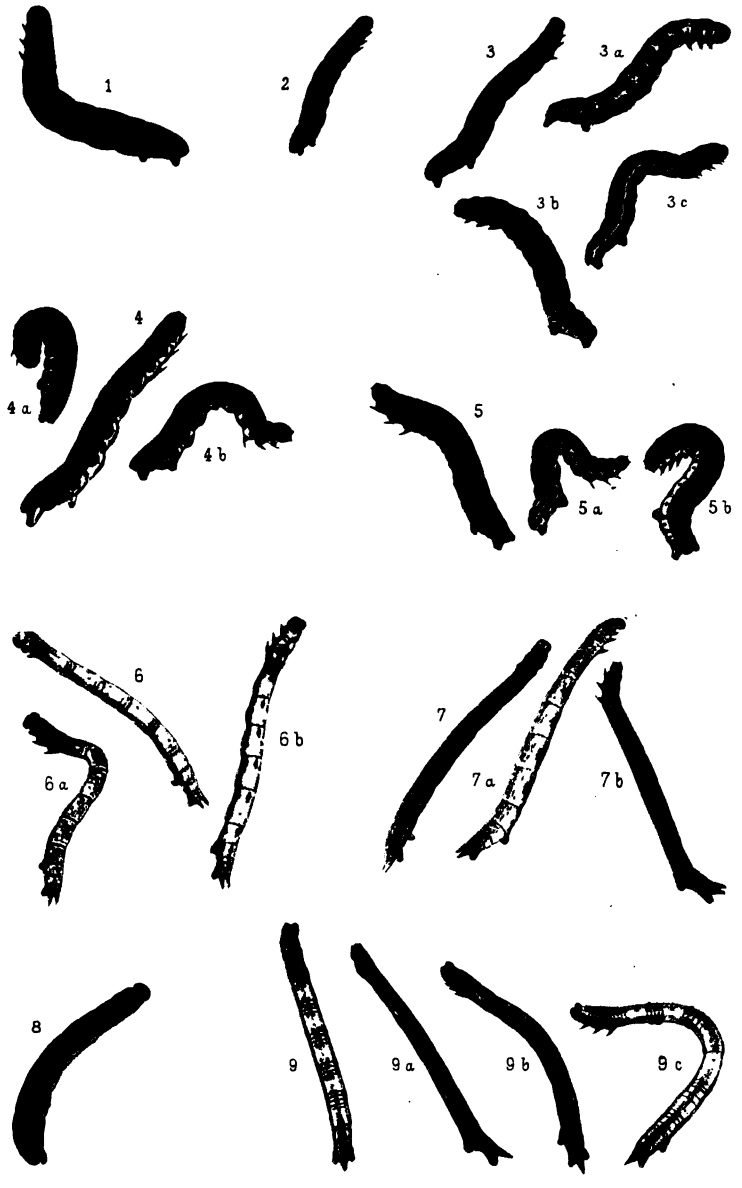
5, 5 *a*, 5 *b*, larvæ after final moult; on *Galium mollugo*, 31st March, 1863; on small-leaved clematis, 29th July, 1864; and on *Galium saxatile*, 4th August, imago appearing 20th August, 1870.

See pp. 78—81.

PHIBALAPTERYX VITALBATA.

6, 6 *a*, larvæ after final moult; on clematis; 20th July and 3rd August, 1861, imago appearing 31st May, 1862; October and 19th November, 1864.

Plate CXLII.



A.J.Wendel lith.

P.W.M.Trap imp.

W. BUCKLER *del.*

PLATE CXLII.

Scotosia dubitata.

1, larva after final moult; on buckthorn, 24th June, imago appearing 25th July, 1861.

Scotosia vetulata.

2, larva after final moult; on buckthorn, feeding between the drawn-together top leaves, 5th June, imago appearing 7th July, 1861.

Scotosia rhamnata.

3, 3 *a*, 3 *b*, 3 *c*, larvæ after final moult; 3, on buckthorn, 5th June, imago appearing 9th July, 1861; 3 *b*, dark variety, 10th May, imago appearing 16th June, 1865; 3 *a*, 16th May, imago appearing 7th July, 1865; 3 *c*, 21st May, imago appearing 9th July, 1865.

Scotosia certata.

4, 4 *a*, 4 *b*, larvæ in various stages; feeding between leaves of barberry; 8th July, 1863, and 4th July, 1864; imagos emerged 8th to 19th May, 1864.

Scotosia undulata.

5, 5 *a*, 5 *b*, larvæ in various stages; in united sallow leaves, 10th August, 1867, imago emerging 9th June, 1868; between spun-together leaves of sallow, 10th September, 1867; 5, between united leaves of aspen, 12th September, 1867.

PLATE CXLII—*continued.*

Cidaria psittacata.

6, 6 *a*, 6 *b*, larvæ after final moult; on oak, 24th July and 15th August, 1863; imago emerged 2nd September, 1863

Cidaria miata.

7, 7 *a*, 7 *b*, larvæ after final moult; on alder, 4th July, 1861; and on willow, 22nd June, 1864.

See pp. 81—82.

Cidaria picata.

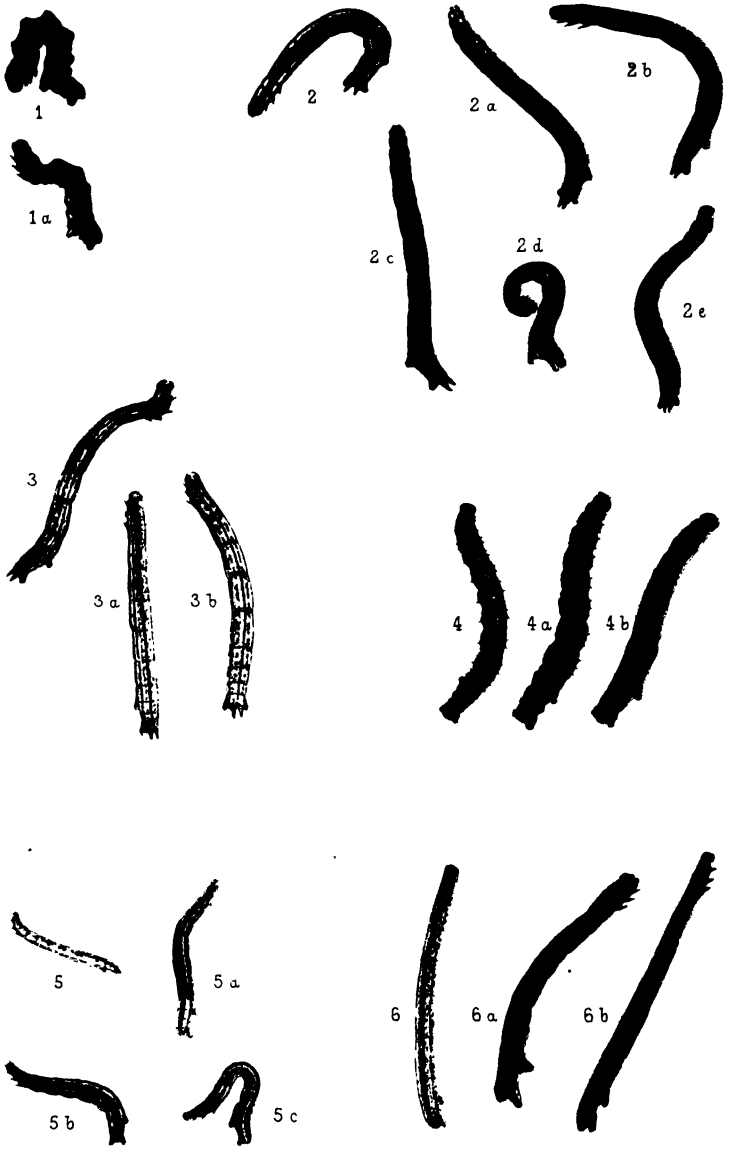
8, larva after final moult; on chickweed, 3rd September, 1861.

See pp. 82—83.

Cidaria corylata.

9, 9 *a*, 9 *b*, 9 *c*, larvæ after final moult; 12th September, 1859, and 17th September, 1863.

Plate CXLIII.



A.J.Wendel. lith.

P.W.M.Trap imp.

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PLATE CXLIII.

Cidaria sagittata.

1, 1 *a*, larvæ after final moult; on water-rue, *Thalictrum aquilegifolium*, and on *Th. flavum*, 20th August, 1863; imagos emerged from end of June to 15th July, 1864.

See pp. 83—85.

Cidaria russata.

2, 2 *a*, 2 *b*, 2 *c*, 2 *d*, 2 *e*, larvæ in various stages; on sallow, 1st April, imagos emerging 20th May, 1861; 16th to 20th July, 1864; 2 *e*, on oak, 18th July, 1861.

See p. 85.

Cidaria immanata.

3, 3 *a*, 3 *b*, larvæ after final moult; 3, from var. *marmorata*; 3 *a* and 3 *b*, from dark northern varieties; on wild strawberry, 20th to 30th May, 8th June, and 12th July, 1864.

See pp. 85—88.

Cidaria suffumata.

4, 4 *a*, 4 *b*, larvæ after final moult; on *Galium mollugo*, 7th July, 1860, imago appearing 20th April, 1861; and on *G. aparine*, 23rd June, 1864.

See p. 89.

Cidaria reticulata.

5, 5 *a*, 5 *b*, 5 *c*, larvæ in various stages; on seeds, flowers, and leaves of *Impatiens noli-me-tangere*,

PLATE CXLIII—*continued.*

31st August, 6th, 8th, 9th, and 13th September, 1876.

See pp. 89—93.

Cidaria silaceata.

6, 6 *a*, 6 *b*, larvæ after final moult; on small willow-herb, 6th August, 1860, 17th September, 1863, and 8th September, 1864.

Plate CXLIV.

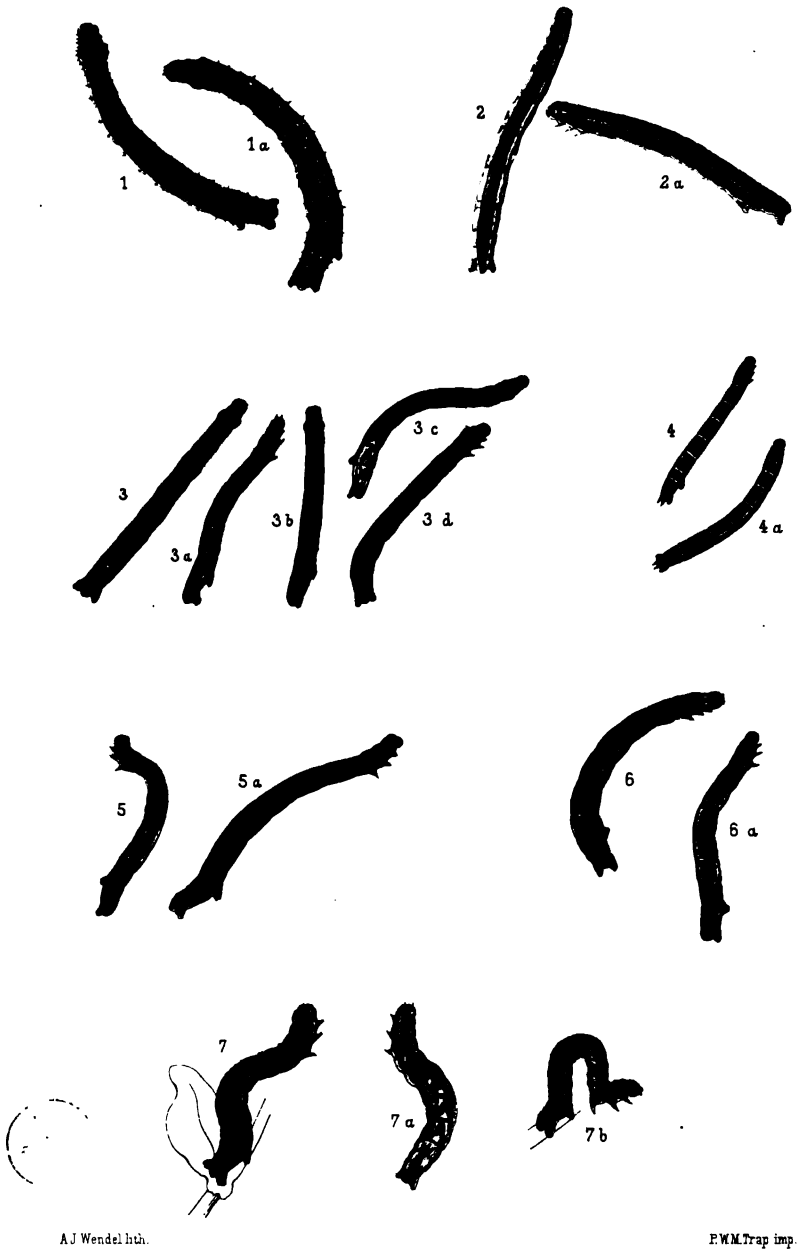

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PLATE CXLIV.

Cidaria prunata.

1, 1 *a*, larvæ after final moult; on gooseberry, 28th May, imago emerging 5th July, 1862; and on red currant, 2nd June, imago emerging 5th July, 1864.

Cidaria testata.

2, 2 *a*, larvæ after final moult; 2, on sallow, 13th August, imago emerging 24th September, 1861; 2 *a*, on heather, Scotland, 11th July, imago emerging 10th September, 1869; some larvæ were much paler in colouring [than those figured].

Cidaria populata.

3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, larvæ after final moult; on sallow, 14th May, 1861, and on bilberry, 8th May, 1863.

See pp. 93—94.

Cidaria fulvata.

4, 4 *a*, larvæ after final moult; on rose, 7th May, 1863.

See p. 95.

Cidaria pyraliata.

5, 5 *a*, larvæ after final moult; on *Galium aparine*, 4th, 9th, and 10th June, 1864; imagos emerged 24th July to 15th August, 1864.

PLATE CXLIV—*continued.*

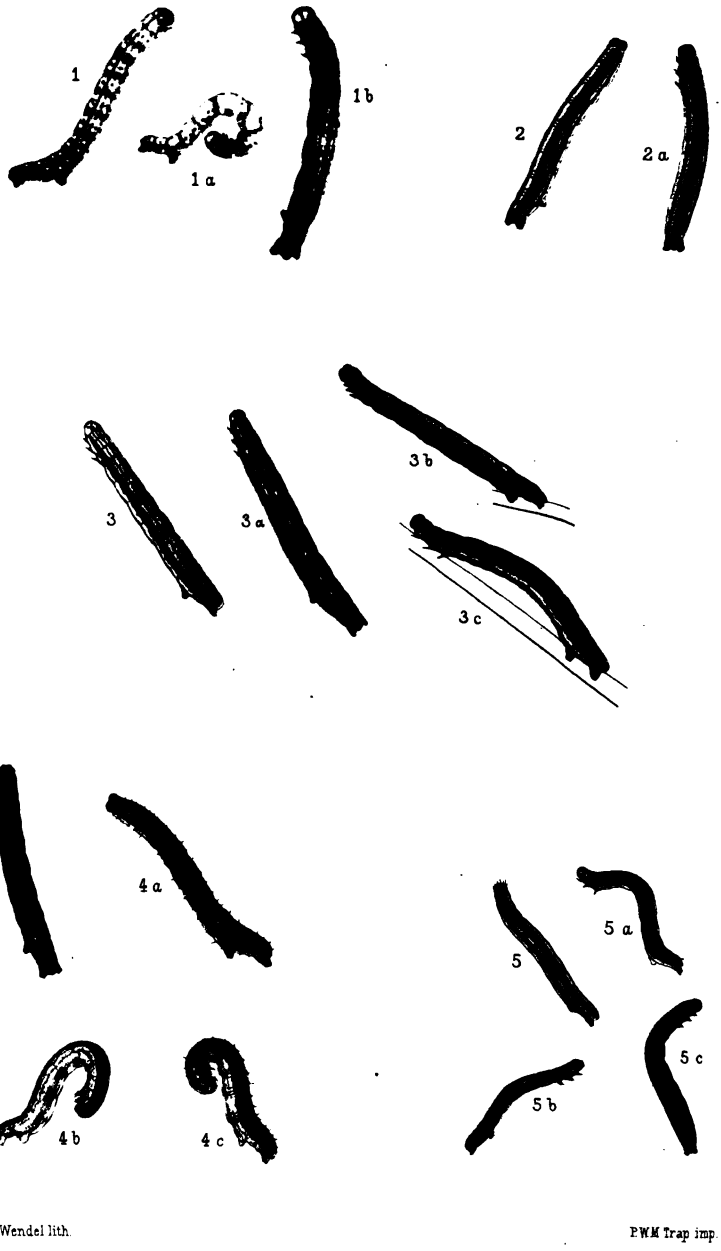
Cidaria dotata.

6, 6 *a*, larvæ after final moult; on red currant, 29th April, 1862, and 27th May, 1864; imagos emerged 20th and 21st June, 1864.

Pelurga comitata.

7, 7 *a*, 7 *b*, larvæ after final moult; on *Atriplex* and *Chenopodium*, 11th September, 1862, and 12th September, 1863.

Plate CXLV.



A.J. Wendel lith.

P.W.M. Trap imp.

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PLATE CXLV.

EUBOLIA CERVINATA.

1, 1 *a*, 1 *b*, larvæ in various stages of growth; on mallow, 8th June, 1860, 8th July, 1861, and 24th May, 1866; imago emerged 24th September, 1861.

EUBOLIA MENSURARIA.

2, 2 *a*, larvæ after final moult; on grass, clover, etc., 27th June, imago emerging 17th August, 1864.

See p. 96.

EUBOLIA PLUMBARIA.

3, 3 *a*, 3 *b*, 3 *c*, larvæ after final moult; on *Genista anglica*, 3rd May, and on broom, 8th May, 1865, imagos emerging 9th to 15th June, 1865; also 20th May, imago emerging 6th June, 1868.

EUBOLIA BIPUNCTARIA.

4, 4 *a*, 4 *b*, 4 *c*, larvæ after final moult; on clover and *Lotus corniculatus*, 11th May, imago emerging 5th July, 1868; 4 *c*, 16th May, 1866.

See pp. 97—98.

EUBOLIA LINEOLATA.

5, 5 *a*, 5 *b*, 5 *c*, larvæ in various stages of growth; on *Galium saxatile* and *G. verum*, 25th June, 1863, and 17th September, 1872.

See pp. 98—101.

Plate CXLVI.

A.J. Wendel lith

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P.W.M. Trap imp.

PLATE CXLVI.

CARSIA IMBUTATA.

1, 1 *a*, larvæ after final moult; on *Vaccinium oxycoccos*, 8th June, 1872; imago emerged 10th July, 1872; reared from the eggs and bred by Rev. John Hellins.

See pp. 102—104.

ANAITIS PLAGIARIA.

2, 2 *a*, 2 *b*, 2 *c*, 2 *d*, larvæ in various stages of growth; on *Hypericum*; 23rd July, 1861; one found mature, 21st April, imago appearing 6th June, 1875; eighteen on *Hypericum*, 6th April, 1866; red variety, 6th July, 1874.

LITHOSTEGE NIVEARIA.

3, 3 *a*, 3 *b*, larvæ in various stages of growth; on flowers and seeds of *Sisymbrium sophia*, 13th July, 1867; also on *S. cheiranthoides*.

See pp. 104—106.

CHESIAS SPARTIATA.

4, 4 *a*, 4 *b*, larvæ after final moult; on flowers of broom, 24th May and 3rd June, 1862; and on broom, 6th May, 1869.

See p. 107.

CHESIAS OBLIQUARIA.

5, 5 *a*, larvæ in various stages of growth; on broom, 12th September, 1867; also 6th September, 1869; imago emerged 16th June, 1870.

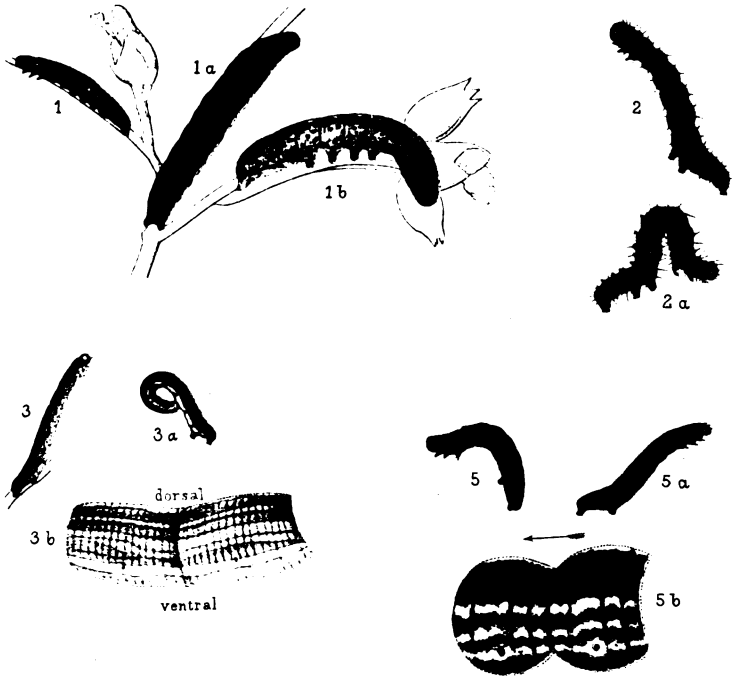
See pp. 107—109.

ODEZIA CHÆROPHYLLATA.

6, 6 *a*, larvæ after final moult; on flowers and seeds of earth-nut (*Bunium flexuosum*), 28th and 30th May, imagos emerging 27th to 29th June, 1867.

See pp. 109—110.

Plate CXLVII.



A.J Wendel lith.

W. BUCKLER *del.*

P.W.M. Trap imp.

PLATE CXLVII.

Dianthæcia albimacula.

1, 1 *a*, 1 *b*, larvæ in various stages of growth; on seeds of *Silene nutans*, 19th, 21st, and 25th July, 1873, sent by Mr. Stainton; imagos emerged 7th, 18th, 19th, and 20th June, 1874.

See Vol. VI, p. 3.

Boletobia fuliginaria.

2, 2 *a*, larvæ after final moult; on cellar fungus, 23rd and 24th June, 1882; sent by Mr. W. H. B. Fletcher.

See Vol. VII, p. 47.

Acidalia ochrata.

3, 3 *a*, larvæ after final moult; 3 *b*, enlargement of two segments; reared from the egg by Mr. W. H. Tugwell; latterly on flowers of *Crepis virens*, 2nd, 3rd, 4th, and 8th November, 1880; spun up, 13th; ♀ imago out 14th December, 1880.

See Vol. VII, p. 80.

Lythria purpuraria.

4, larva after final moult; on *Rumex acetosella* from eggs, from Herr Heinrich Disqué, 21st August, 1883.

See Vol. VII, p. 144.

Cheimatobia brumata.

5, 5 *a*, larvæ after final moult; 5 *b*, enlargement of two segments; 25th May, 1881; from Rev. John Hellins.

See Vol. VII, p. 160.

PLATE CXLVII—*continued.*

Oporabia dilutata.

6, larva after final moult; on elm and hawthorn, Rev. John Hellins, May, 1881.

See Vol. VII, p. 161.

Oporabia autumnaria.

7, larva after final moult; Scottish, on oak, Mr. Elliot, 5th, 6th June, 1882; Rev. John Hellins reared one more of these 7th June, 1883, and bred several moths.

Oporabia filigrammaria.

8, 8 *a*, 8 *b*, larvæ in various stages of growth; 8 *c*, enlargement of two segments; on heather, willow, 27th May, young, and 30th May, 10th June, 1881.

See Vol. VII, p. 163.

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